Vol. 10, No. 4

APRIL, 1955

# AGRICULTURAL CHEMICALS

*In This Issue:*

NAC Spring Report • Illinois Natural History Survey • Boron in Fertilizers • Cotton Insecticides • Fertilizer Use • 1954 Fungicide Tests • Agricultural Chemicals in the Philippines • Potomac Phytopaths Meet • Profits . . . for a Healthy Industry

## Giant Servant of Agriculture

The knowledge farmers have gained in past planting seasons holds promise of a bountiful harvest. Expansion of our abundant agriculture is proof that continued research on fertilizers, seeds, and machinery is paying dividends.

This increased understanding shows that the more you know — the more you have to learn.

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RED MURIATE

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# Bad news for him . . . good news for you

*Just Off Press . . .*

*. . . the current issue of Attaclay Pesticide Digest, discussing various aspects of pesticide processing. Write for your copy, and future Digests as published.*

Could it be this worried army worm is reading his own death warrant in the Attaclay Pesticide Digest? Oh, well . . . his hard luck is your good fortune.

The article—so disturbing to the worm—tells how Attaclay's over-all efficiency and flexibility *give you maximum production of dust bases and wettable powders.* Attaclay is the formulator's star performer when the rush season is on . . . when men and equipment often are asked for a production rate that's far in excess of plant capacities.

Attaclay gives you a big margin in sorptivity to get the most out of reduction mills . . . cycle times in ribbon blenders are speeded up . . . and the milling or grinding operation following liquid impregnation goes much faster and easier. This same sorptive capacity keeps dusts on the double-quick through conveyors, hoppers, chutes and packaging machines.

Attaclay's efficiency extends to the full range of synthetic organic pesticide chemicals. With only *one* across-the-board carrier and diluent to stock, you save time, trouble, and money in ordering, warehousing, scheduling, and handling.

Our suggestion! Depend on Attaclay to keep your plant producing premium products at speediest rate. We're pleased to offer large free samples and technical help.

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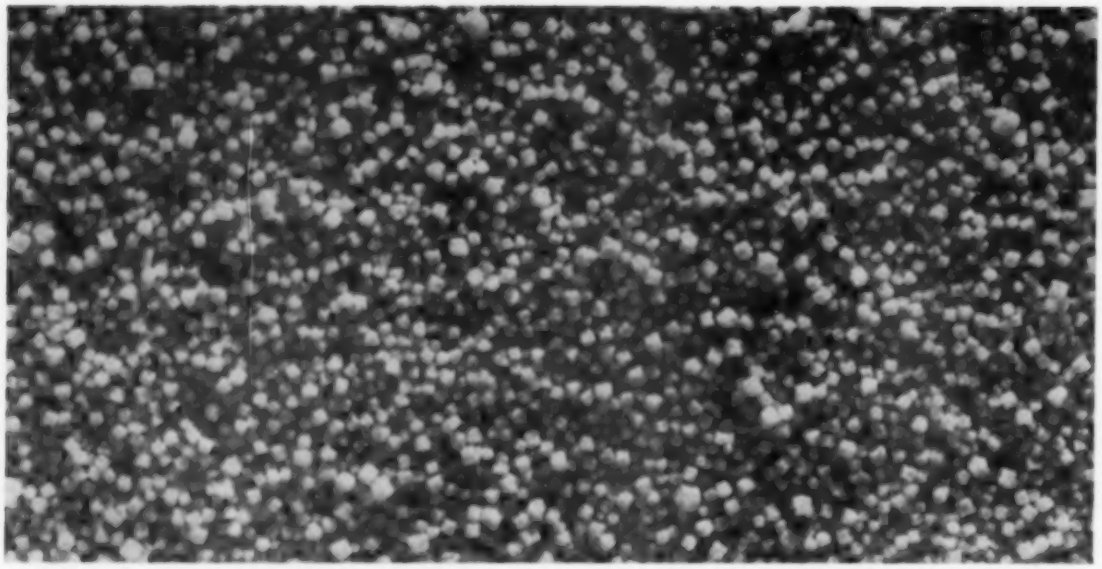

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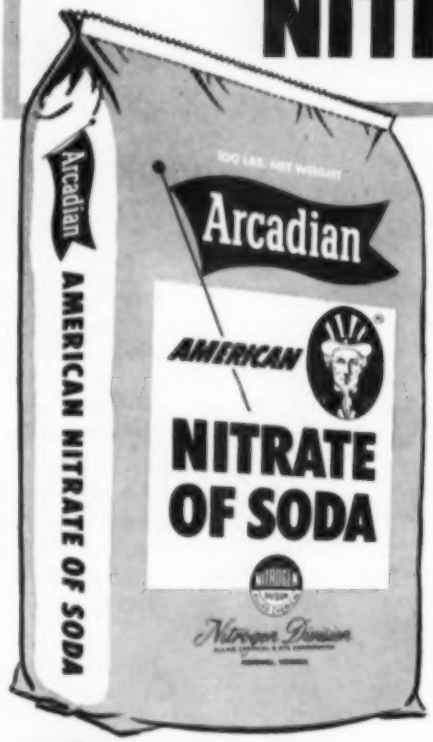


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# AGRICULTURAL CHEMICALS

**This Month's Cover**

Candid shots of some industry members attending the 1955 spring meeting of the National Agricultural Chemicals Association Meeting, March 7-9 at the Chase Hotel, St. Louis. See page 34 for identification of photos. Convention report and other photos on pages 30-34.


APRIL 1955
Vol. 10 No. 4



**A Monthly Magazine For the Trade**

•

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*Advertising Manager*

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## *AGRICULTURAL CHEMICALS*

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# Phosphatic Fertilizer Solution

California Formulator Blends Monsanto's Solution with Aqua Ammonia to Make Neutral 8-24-0 for Direct Application

Mounted behind cutting blades for protection, slender hoses carry liquid 8-24-0 from tank into soil as fast as it is broken.

Side-dressing eight rows of carrots at a time is simple chore for this rig. Note twin tractor-mounted tanks for carrying 8-24-0 used by this fertilizing contractor. Formulator also sells direct to farmer, and does fertilizing on contract.

Fertilizer tank follows wide-spread drill rig. Set-up is particularly well suited to preplanting fertilization which may take place in either spring or fall in Sacramento-Imperial Valley-San Joaquin area where much of the 8-24-0 is sold.

New-type liquid fertilizer drill and tank arrangement gets trial. Formulator maintains sizable test area for trying out new liquid fertilizer applicators, and to observe results of various liquid fertilizer formulations on crop response.

Giant drill rig covers a lot of ground fast, gets through matted surface of field to inject 8-24-0 into root zone. Side mounting of these fertilizer tanks makes it possible to carry a full day's supply without delays for refilling.

8-24-0 is used on all varieties of crops. Here's a set-up that's ideal for applying it in close row work. The large fertilizer tank is mounted out of the way in the rear. Fertilizer drills located in front help driver guide tractor.

Photographs courtesy Bren Chemicals, Inc.

Formulator's customers don't need potash, so company makes 8-24-0. If your trade calls for a complete soluble fertilizer, Monsanto has the right ingredients:

| | |
|---|---|
| Diammonium Phosphate | (21.0-53.8-00.0) |
| Monoammonium Phosphate | (12.2-61.6-00.0) |
| Phosphatic Fertilizer Solution | (00.0-54.5-00.0) |
| Dipotassium Phosphate | (00.0-39.9-53.0) |
| Monopotassium Phosphate | (00.0-51.6-34.2) |

These compounds are highly concentrated—cost you less to store and handle. They're pure—give you extremely close control of formulation. And—your supply is assured by Monsanto, world's largest producer of elemental phosphorus. Write now for booklet "Concentrated Water Soluble Fertilizers" to MONSANTO CHEMICAL CO., Inorganic Chemicals Division, 710 N. 12th Boulevard, St. Louis 1, Missouri.

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- *Kill maggots*
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The integral construction of this exclusive Kraft Bag feature solves all those tricky closure problems peculiar to bagging granular material.

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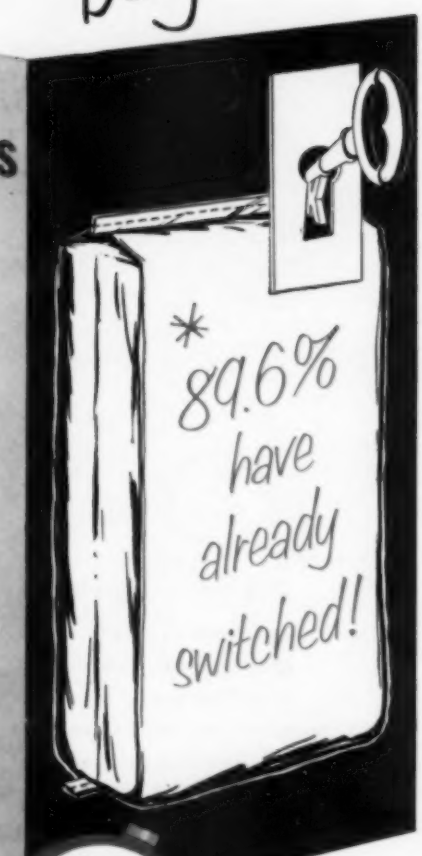
COMPANY _____

ADDRESS _____ ZONE _____ STATE _____

CITY _____

## 10 good reasons why packers of granulated fertilizer prefer KRAFT-lok Bags:

1. Eliminates snagging on packer tubes.
2. More flexible valve area improves bag handling.
3. Prevents torn sleeve particles from contaminating material.
4. Speeds up filling operations by more efficient "venting."
5. Slows up spilling in filling.
6. Reduces leakage in closing.
7. Actually seals material inside bag automatically.
8. Minimizes sifting in handling.
9. Makes a cleaner, more satisfactory package in all ways.
10. Saves dollars all around.

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## Meeting Calendar

**March 29-April 7**—American Chemical Society, national meeting, Netherland Plaza Hotel, Cincinnati, O.

**April 26** — Spring Fertilizer Conference, sponsored by the Soil Improvement Committee of the California Fertilizer Association, Campus of the University of California, Davis, Calif.

**April 14** — Arwell Sanitation Seminar, Sheraton Hotel, Chicago.

**May 3-4** — Carolinas-Virginia Pesticide Formulators Association, Pinehurst, N. C.

**May 15-17**—Chemical Specialties Manufacturers' Assn., Statler Hotel, New York

**May 19** — Fertilizer Section, 25th Annual North Carolina Safety Conference, Winston Salem, N. C.

**June 2** — S. C. Fertilizer Meeting, Sand Hill Experiment Station, near Columbia, S. C.

**June 3** — Fertilizer Section, Virginia State Safety Association, Richmond, Va.

**June 12-15** — National Plant Food Institute Convention (joint meeting of APFC and NFA), The Greenbrier, White Sulphur Springs, West Va.

**June 21** — Western Agricultural Chemicals Assn., Hotel Clark, Los Angeles.

**June 22-24** — Pacific Slope Branch, E.S.A., Mission Inn, Riverside, Calif.

**June 28-30** — Regional Fertilizer Conference, Pacific Northwest Plant Food Association, Boise Hotel, Boise, Idaho.

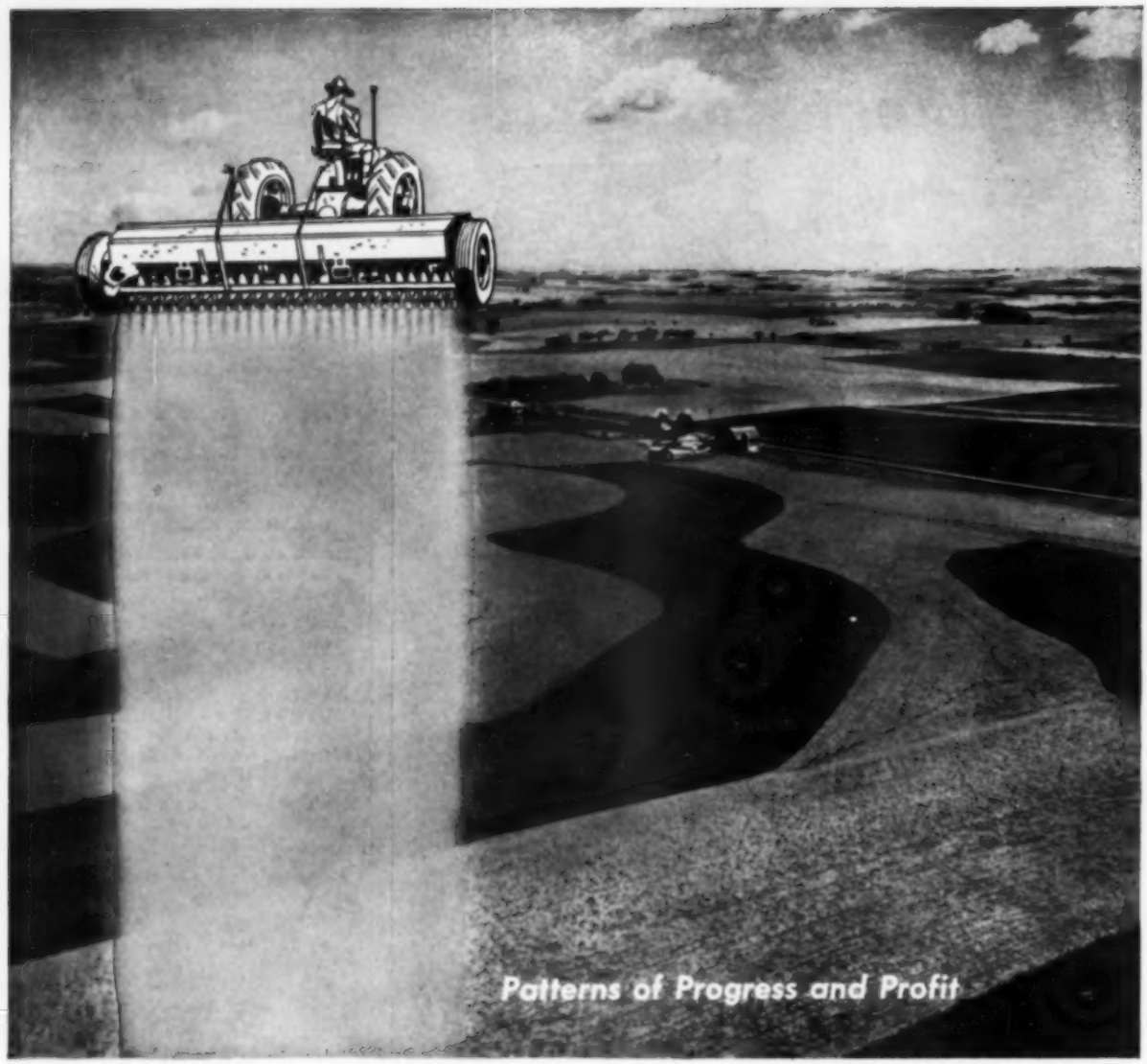
**Sept. 7-9**—National Agricultural Chemicals Assoc., Annual meeting, Spring Lake, N. J.

**Nov. 7-8**—California Fertilizer Assoc., 32nd annual meeting, Hotel Mark Hopkins, San Francisco.

**Nov. 28-Dec. 1** — Entomological Society of America, Annual Meeting, Netherlands Plaza, Cincinnati.

You can read about the home town in the local newspapers . . . but if you want to keep up on what's going on in the agricultural chemicals industry . . . and keep up on new developments in the trade you'd better keep your copies of "Agricultural Chemicals" coming.

If you aren't on the ball, and are not a subscriber, better send in your order now to: Agricultural Chemicals, P. O. Box 31, Caldwell, New Jersey.




*(Photo — Courtesy Soil Conservation Service, U. S. D. A.)*

# *High Grade Muriate of Potash*

*by* DUVAL

Duval Muriate of Potash ranks high as one of the essential nutrients which greatly increase yield and profits in crop production.

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These important facts – and the reasons behind them—are explained, simply and accurately, in the two new pamphlets prepared by United States Steel agronomists.

The pamphlet, "MAKE BIGGER PROFITS WITH USS AMMONIUM SULPHATE" includes profit-building recommendations and remarks on corn and on many other crops as well. The symptoms of nitrogen deficiency and sufficient nitrogen are dramatically compared in full color.

The other color pamphlet, "HOW TO FIGURE NITROGEN FOR BIGGER CORN YIELDS" includes a useful and dependable field worksheet on which the farmer can easily figure his own nitrogen requirements. Starting with his *desired* per acre yield, he can figure the nitrogen he already has and how much more he needs to get the yield he wants.

## How many do you want?

This is a first-rate, down-to-earth opportunity to boost your nitrogen sales. Check the number of pamphlets you want on the coupon and we will rush them to you free of charge. Be sure that every customer gets one.

But don't delay . . . the spring fertilizing season is at hand. Mail the coupon today.

**USS AMMONIUM SULPHATE**

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Agricultural Extension Section, Room 4675
525 William Penn Place, Pittsburgh 30, Pa.

Please rush to me, without charge, my copies of your new, full color literature as follows:

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____ copies of "How to figure nitrogen for bigger corn yields"

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Company.....

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City..... .....State.....

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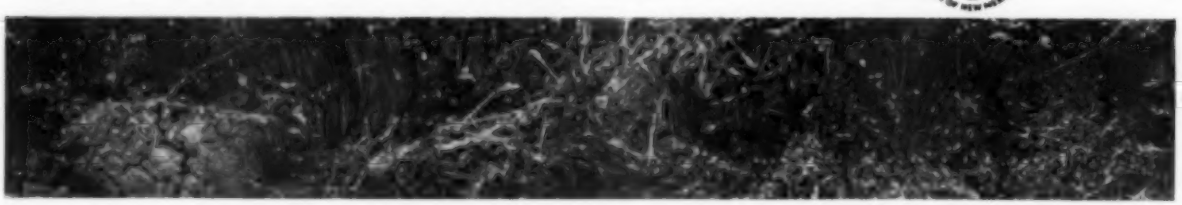

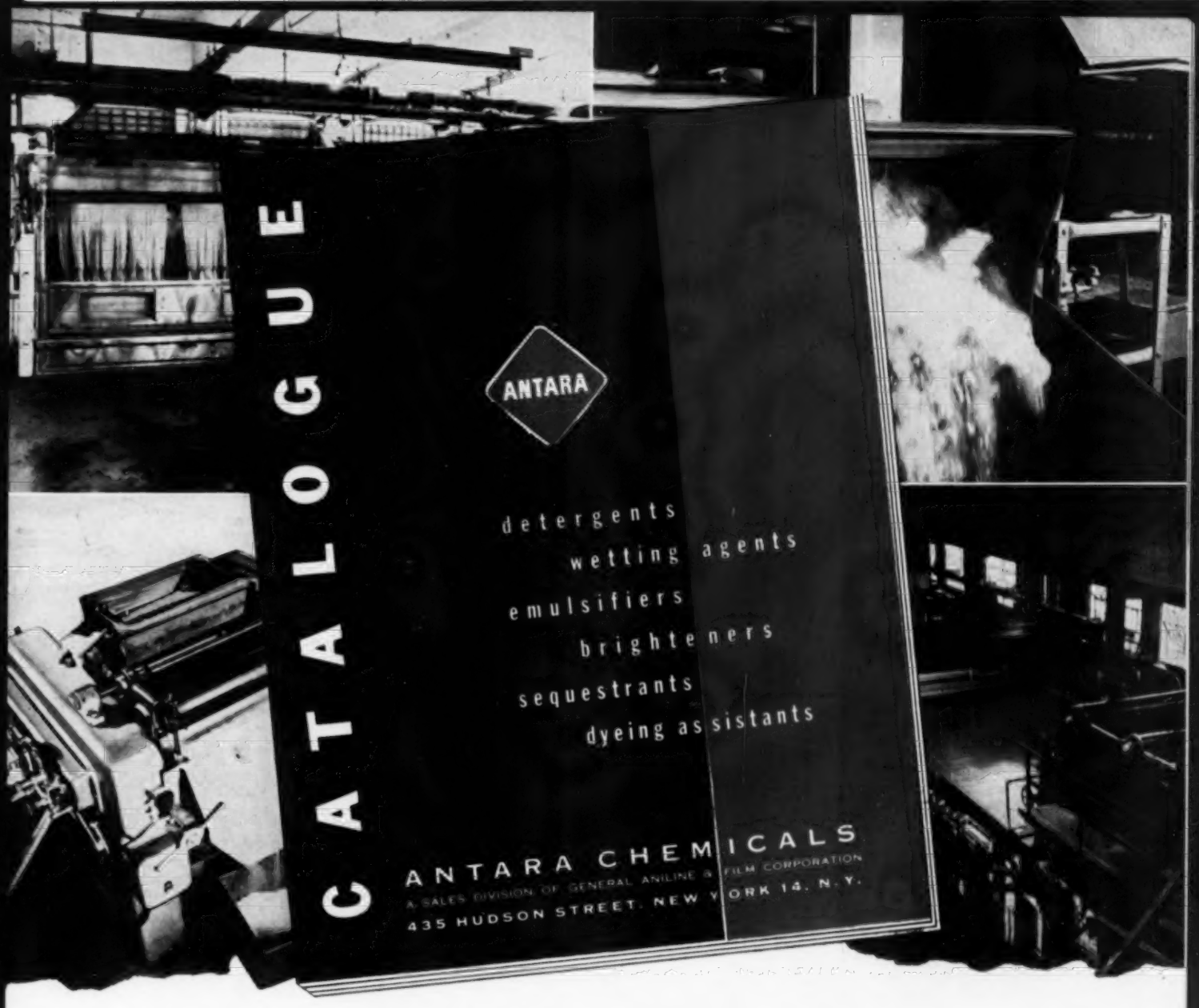


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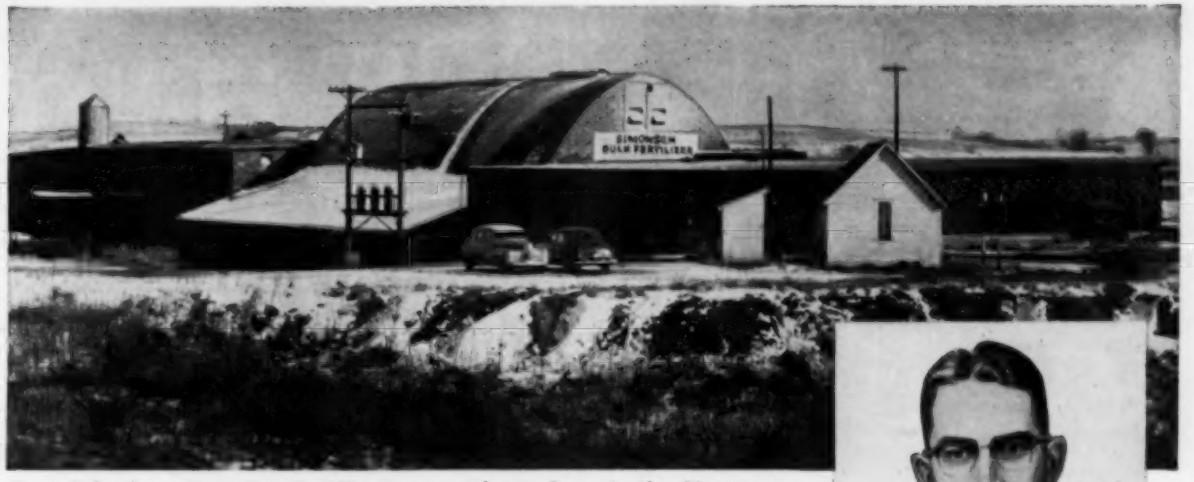


**One of the fastest growing** fertilizer companies in Iowa is the Simonsen Mill Rendering Plant which serves farmers in a 70 mile radius of Quimby, Iowa. The company started in 1950 with one bulk spreader and has added several trucks each year. This year the company is installing continuous ammoniator and granulation equipment.

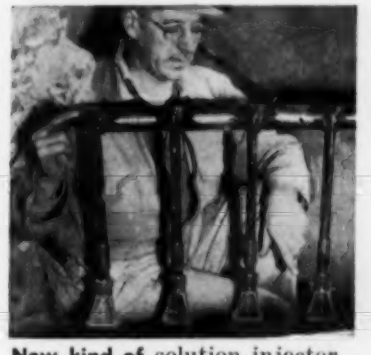
**Dr. D. W. Simonsen** is a partner and manager of the Simonsen Mill Rendering Plant which sells at retail and spreads nearly its entire output.

# Simonsen Mill Rendering Plant

## . . . Another Spensol User

**Here is some of** the modern equipment used by Spencer to produce SPENSOL Nitrogen Solutions for some of America's leading fertilizer mixers.

**On time deliveries** of SPENSOL solutions have helped to build Spencer's reputation for dependable service to mixers throughout the country.



**New kind of** solution injector, giving better ammoniation of mixed fertilizer, was invented by H. B. Davis of Spencer Chemical Company staff.

SPENCER

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Polybor-Chlorate destroys weeds and grasses *on contact* and through *root action* . . . then residual action continues, to prevent regrowth. This is one weed killer than can destroy *all* vegetation quickly and easily when applied properly! Polybor-Chlorate is so highly soluble that continued agitation of spray equipment is unnecessary. This herbicide combines the effective plant-destroying powers of sodium borates and sodium chlorate; it is non fire-hazardous! Polybor-Chlorate is a labor saver and a money saver . . . one spraying may suffice to keep the treated area bare of growth for a year or more!

**YOU CAN DESTROY ALL OF THESE WEEDS and GRASSES . . . EASILY**

BINDWEED (Wild Morning-glory) ○
QUACKGRASS ○ CANADA THISTLE ○
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*. . . and many, many others!*

**NO FIRE HAZARD**

FAST-ACTING
APPLY WET OR DRY
ECONOMICAL
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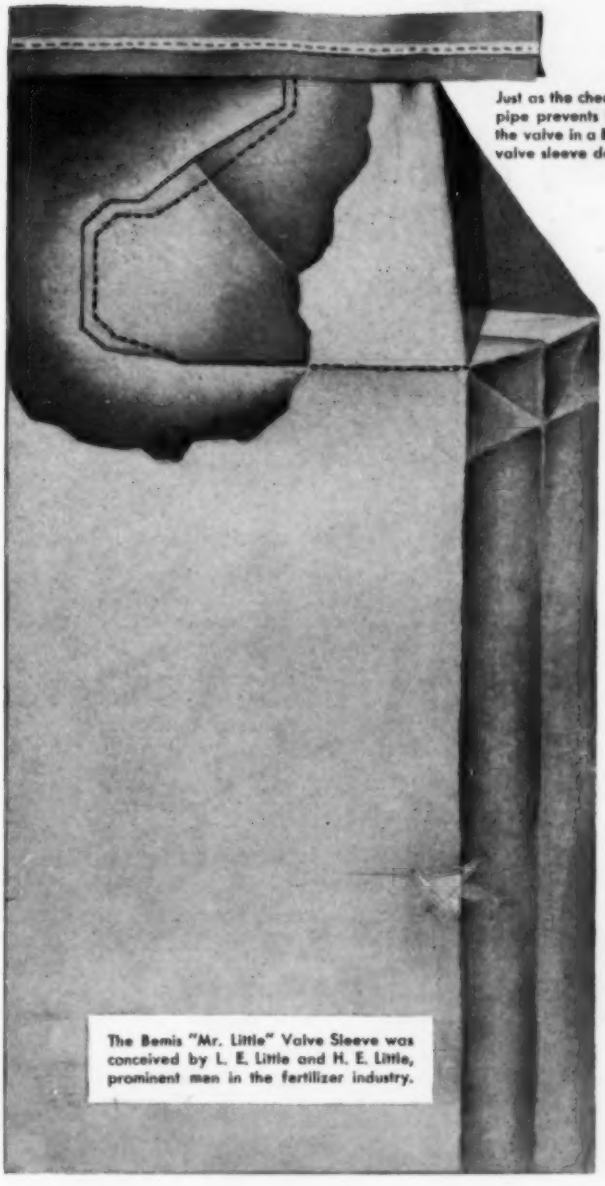
## PACIFIC COAST BORAX CO.

DIVISION OF BORAX CONSOLIDATED, LIMITED
630 SHATTO PLACE, LOS ANGELES 5, CALIFORNIA

MANUFACTURERS OF FAMOUS "20 MULE TEAM" PACKAGE PRODUCTS

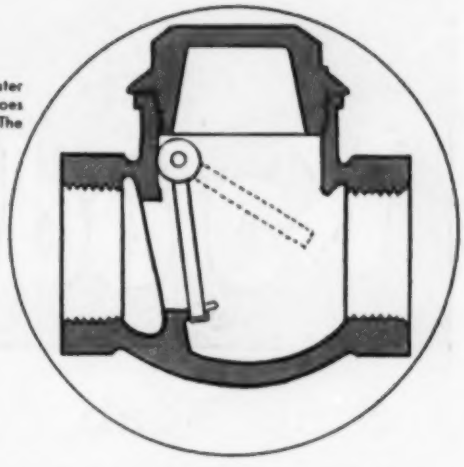
# The most revolutionary Multiwall Bag development in years!

# the NEW Bemis "Mr. Little" Valve Bag*



The Bemis "Mr. Little" Valve Sleeve was conceived by L. E. Little and H. E. Little, prominent men in the fertilizer industry.

Just as the check valve in a water pipe prevents back flow, so does the valve in a Bemis Multiwall. The valve sleeve does the trick.



Maximum Sifting Protection—Creases in the valve sleeve—a new principle—give a faster-acting, tighter closure particularly with troublesome granular or pelletized products. It *really seals in* the bag contents.

Valve Corner Moisture Protection—Since bag contents do not get into the valve pocket, "wick" action that draws moisture into the bag is avoided.

Cleaner Packing—Handling—Shipping—No more spilled fertilizer on packing room floors and conveyors; no more dirty cars received by your customers.

Ask your Bemis Man for the *complete* details. He'll gladly show and demonstrate the revolutionary new "Mr. Little" Valve Bag. Write or call him today.

Bemis

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**Sales Offices in Principal Cities**

*Pat. Applied for

# Stop Scab Trouble Before It Starts

*It's in the Bag!*

Non-caustic Kolodust contains fused sulphur absorbed into bentonite by an exclusive Niagara process to produce a highly penetrating toxic dust that sticks to foliage and fruit through prolonged and heavy rains. There is "no just as good" substitute—don't risk anything less than exclusive Kolodust.

Scab spores are most active in the rain. So is Kolodust. For Kolodust is the *only* material that cuts through the raindrops and sticks to foliage, buds or fruit both during and after the storm.

There's no more *gentle* orchard protecting material than Kolodust. It is non-caustic and absolutely safe. Trees dusted with Kolodust function normally. Users benefit from larger leaves, a smoother fruit finish and more buds for next year's crop.

Here's another advantage. Kolodust, when applied with a powerful Niagara duster, *goes on fast*. Applications can be timed for maximum kill of scab spores during periods when ground conditions bog down sprayers.

Better growers everywhere *Kolodust in the rain*. They get timely protection when it counts. They consistently harvest a heavy crop of finer finished fruit.

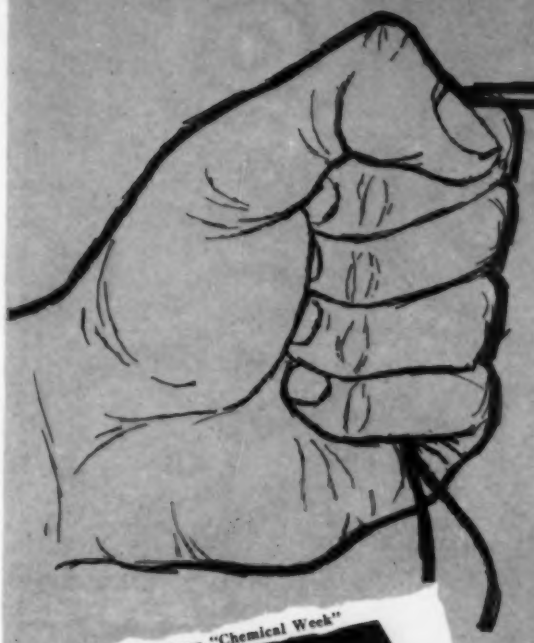
**Niagara** INSECTICIDES, FUNGICIDES, AND ORCHARD DUSTERS

Niagara Chemical Division

FOOD MACHINERY AND CHEMICAL CORPORATION

*Middleport, New York,* Richmond, Calif., Jacksonville, Fla., Tampa, Fla., Pompano, Fla., Wyoming, Ill., New Orleans, La., Ayer, Mass., Harlingen, Tex., Pecos, Tex., Yakima, Wash. *Subsidiary:* Pine Bluff Chemical Co., Pine Bluff, Ark. *Canadian Associate:* NIAGARA BRAND SPRAY CO., LTD., Burlington, Ontario

# control... your emulsifiable **BHC** concentrates



**Blends of the new**

**EMCOL H-400 H-500**

**emulsifiers in combinations will provide greatest flexibility in performance, *regardless* of mid-season source changes.**

It doesn't matter which technical BHC or solvents you use . . . or what gamma isomer percentage you formulate. Combinations of Emulsol's EMCOLS H-400 and H-500 will compensate for such variables at the lowest possible cost with the requisite ageability and emulsifiability . . . with complete *control* in your hands.

This season will prove it for you.

Reprinted from "Chemical Week"

**new idea mart** from the EMULSOL lab

A thought or two about things new and interesting in the field of surface-active chemistry . . .

*Better with know-how*

The workhorse of the pesticide industry, EMCOL H-Series emulsifiers have proven themselves over six growing seasons. Their success in handling more insecticides and herbicides, under more varied conditions than any other product, has won them "Croix de Guerre" acclaim among those who fight to conserve world supplies of food and fiber.

***We will be happy to recommend the proper Emcol emulsifier blends for BHC, BHC-DDT, Lindane, etc., for your specific toxicant, solvent and formula requirements. Contact your local Emulsol representative or us directly for prompt technical service. Technical Bulletin on request.***

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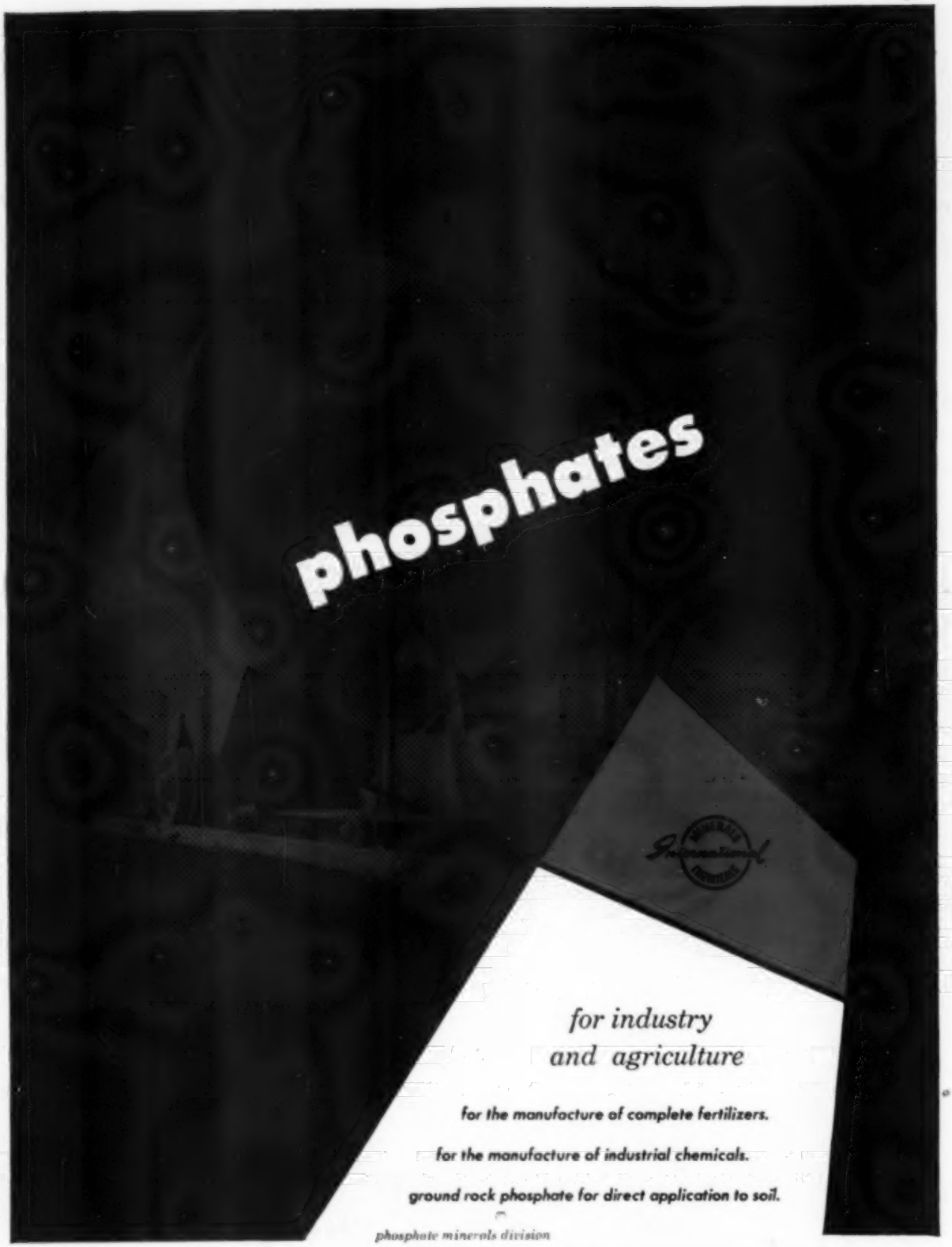
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for the manufacture of complete fertilizers.
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GENERAL OFFICES: 20 NORTH WACKER DRIVE, CHICAGO 6 • Phosphate Mines and Plants in Florida at Noralyn, Peace Valley, Achan, Mulberry; in Tennessee at Mt. Pleasant and Wales • INTERNATIONAL produces phosphate, potash, complete fertilizers and feed phosphates for the American farmer.

# AUTOMATION*

## * the key to "Push Button Control" of PLANTS DESIGNED BY DORR-OLIVER

Instrumentation . . . centralized control . . . completely automatic operation . . . no fertilizer plant can be completely efficient unless it employs these three principles. And that's what you get with *every* plant designed by Dorr-Oliver. Its complete mechanization and simplified control bring to the industry new conceptions for ease of operation, high production, lower manufacturing costs and quality product control.

Illustrated above are typical "nerve centers" that centralize process control at various plants designed by Dorr-Oliver. Here's how *you* can benefit with automation . . . new plants go into commercial production faster . . . you have complete control over all operations . . . electrical controls spot troubles immediately, save lost production time . . . prevent equipment damage . . . instruments control and record every phase of the operation for present and future process analysis.

If you are considering a new plant . . . or expanding present facilities. . . it will pay you to check all the factors that make an installation designed by Dorr-Oliver a modern and efficient chemical plant. Bulletin #8000 which gives the complete story is available on request. Better still, why not talk to a Dorr-Oliver engineer? There is no obligation of course.

Free flowing granules . . . important characteristics of concentrated chemical fertilizers produced by plants designed by Dorr-Oliver.

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WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U.S.A.

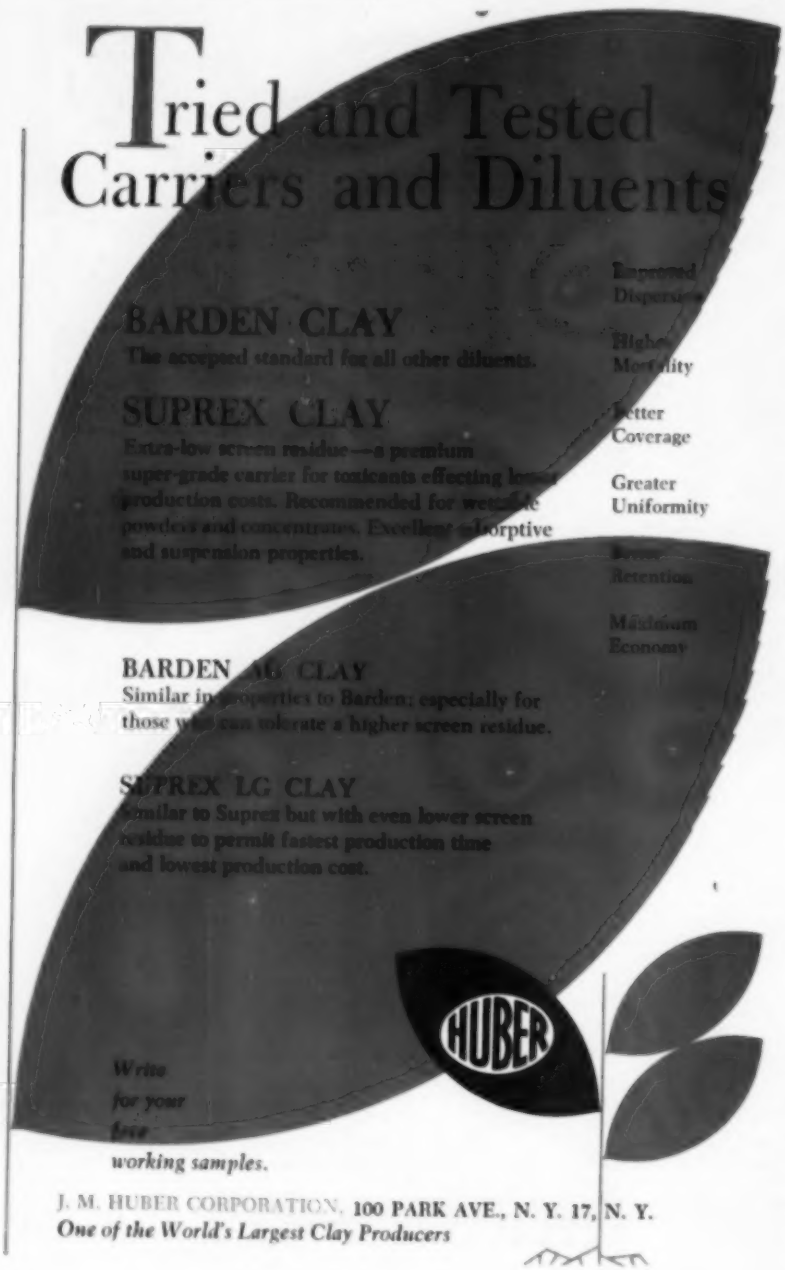
## Thru The Sifter

**Calspray made the January issue of "Reader's Digest" with a four-page article on Captan fungicide. And they gave it a real "R-D" twist, of course. The big discovery of Captan was made, not by routine testing of anything that might have figured to give results but rather when "Chemist Allen R. Kittleson, ignoring his shelf of still untested chemicals, decided to borrow a flask containing a liquid of no known value that he had observed in a neighboring laboratory."**

**Must it ever be thus? Are the routine virtues never to be rewarded? Must the important discoveries always be made by chemists who are looking for something else? We were reminded, of course, of the invention of the telescope by the lazy watch maker's apprentice who beguiled the time looking at a distant spire through a crude lens, and the development of glass figure making by a guy who let some brandy spill on his spectacles (the wastrel).**

**We have a tip for chemist Kittleson, in any case. Don't be snitching our flask. It won't contain any new Captan, and it might not even be scotch.**

**AC**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Carriers and Diluents
BARDEN CLAY
The accepted standard for all other diluents.
SUPREX CLAY
Extra-low screen residue—a premium super-grade carrier for toxicants effecting lowest production costs. Recommended for wettable powders and concentrates. Excellent sorptive and suspension properties.
Greater Uniformity
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BARDEN AG CLAY
Similar in properties to Barden; especially for those who can tolerate a higher screen residue.
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Similar to Suprex but with even lower screen residue to permit fastest production time and lowest production cost.
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Write for your free working samples.
J. M. HUBER CORPORATION, 100 PARK AVE., N. Y. 17, N. Y.
One of the World's Largest Clay Producers


DEPARTMENT OF REMARKABLE COINCIDENCE: The Pequot Press just published "Two Ears of Corn," the life story of Charles H. MacDowell, which was commented on very favorably in these pages last month. Now D. Van Nostrand put the title "Two Ears of Corn, Two Blades of Grass" on their new book by Dr. D. H. Killeffer who reviews the contributions which chemistry is making to our modern living standards through increased and more economical production of food, drugs, etc. We have a little volume in preparation ourselves which we had thought of calling "Three Blades of Corn, Four Ears of Grass," but apparently we have been beaten to the punch.

**AC**

*Seriously we do have a book on the fire. It will be called "Insecticide Diluents and Extenders." Based on the work on this subject started at Cornell University five years ago by Thomas C. Watkins and L. B. Norton and now revised under the supervision of Donald E. Weidhaas and James L. Brann, Jr. Look for publication about June 1.*

**AC**

**There has been too much talk about "miracle products," writes an AC reader, so much so that too many users of agricultural chemicals are looking for such new miracle materials to do the job faster and better. Thus they have a way of overlooking many of the old standard materials which always did and still do a pretty good job themselves. He allows as how some of the older materials like the dinitros, 2,4-D, IPC as well as many of the older tried and tested insecticides, are more efficient performers than many of the newer materials. The secret with any product, he reminds, is working out correct dosages, application techniques, timing and growth factors for the particular area in which they are used. And he points up his observations with the note that in Nevada they are reverting to use of the old "Sinox" paste for onion weeding after having tried out most of the new products with little success.**

**AC**

*Free for nothing we offer this copy theme to some alert fertilizer manufacturer. "Laugh yourself sick as you spread Funny-brand fertilizer." The snapper is that the nitrogen oxidizes to give off $NO_2$ which is of course the old familiar dentist's auxiliary, "laughing gas."*

**AC**

**Though the official announcement had not been released when NAC held its meeting last month in St. Louis, it seemed to be an open secret that Shell are moving their agricultural chemical operations back east from Denver. Quarters have been taken at 460 Park Avenue in New York City. Fred Hatch came east early in March and the transfer of the entire Denver agricultural sales staff is expected to be completed by May 15th.**

# "The hands unload them rough"

—says Fred Schroer, Jr. of Valdosta, Ga.

"I've never seen a thread give under this pounding and believe me, if they weren't tough burlap bags, we'd have a heavy loss over the years from waste."

Fred should know. He and his brother, Herbert, now run the 1200-acre farm of their father, Fred W. Schroer, retired Master Farmer and pioneer in the modern agricultural age of South Georgia. Mr. Schroer says he's been using burlap bags since 1912 and, "During the years, I've had less trouble with burlap bags than any one thing I use. First thing I did this year was put in our fertilizer order—in burlap bags, of course. You can't beat them—no matter how you try or what you use."

That's a strong statement from such an outstanding farmer, but typical of what farmers all over the country tell us. Burlap bags are *preferred* by farmers.

## *Just ask your own customers—*

### *they'll tell you that burlap*

**Is strong** — takes dragging, dropping, *man-handling* — any tough job on the farm.

**Gives good ventilation** — keeps farm supplies and products fresh.

**Laughs at sudden showers** — wetness or dampness can't weaken it.

**Saves money** — extra value from re-sale and re-use.

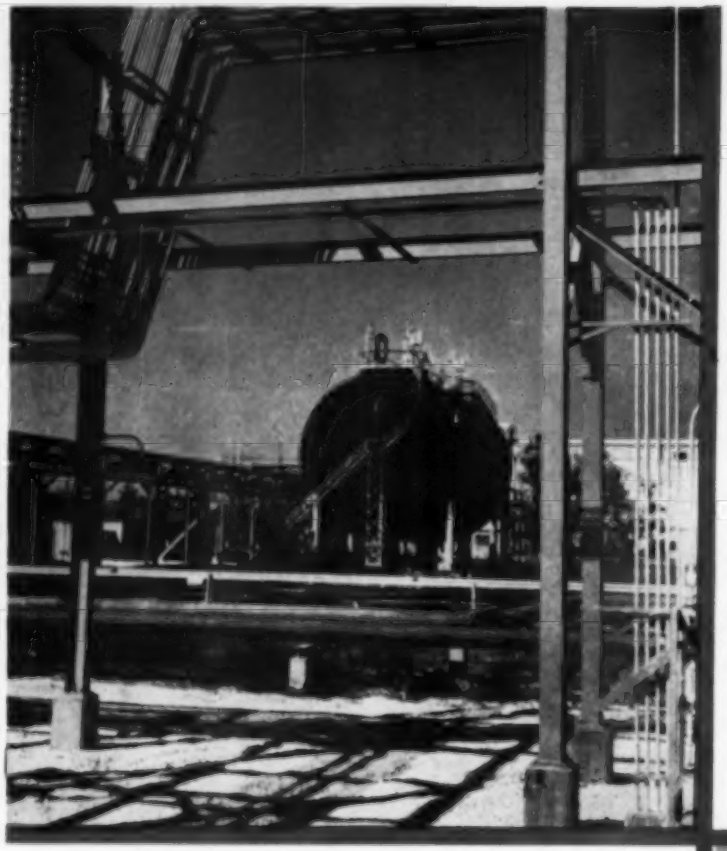
**Saves storage space** — stacks to any height without slipping.

**Has 1000 uses** — always in demand on the farm (popular with farm wives, too!)

**THE BURLAP COUNCIL**

*of the Indian Jute Mills Association*

155 East 44th Street, New York 17, N. Y.



## ANHYDROUS AMMONIA

*gives a low-cost nitrogen for crop feeding. Storage spheres such as these hold gaseous anhydrous under pressure.*

# *Anhydrous Ammonia is now available*

*from Cyanamid's giant new Fortier plant at New Orleans, La. We will welcome the opportunity to fill your '55-'56 anhydrous requirements.*

**Call on Cyanamid for all these fertilizer materials:**

Anhydrous Ammonia
Ammonium Sulphate
Phosphate Rock
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**AERO® Cyanamid:** Fertilizers—Defoliants—Herbicides
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**PHOSPHATES** for Acidulation and Direct Application
**THIOPHOS® Parathion** Technical
**MALATHION** Technical
**CYANOGAS® Calcium Cyanide** Fumigants
**HCN** Fumigants
**POTASSIUM CYANATE** Weedkiller for Agriculture and Turf

# Editorial
## COMMENTS

CAN the big chemical companies do an efficient and economical job of selling and servicing the insecticide user? There seem to be quite a few concerns who in the past have contented themselves with producing basic raw materials, letting others tussle with the headaches connected with distribution, sales and service, who are today abandoning this historic pattern and seeking to compete in the consumer market with concerns who were only recently their customers.

Some of these seekers after greener pastures may make the idea work,—and some may not! For, as one speaker at the recent N. A. C. session in St. Louis pointed out, "it would appear that the small local firms have an advantage in selling agricultural chemicals because of their knowledge of local conditions, quick adaptability to local demands and faster delivery."

Considerable scepticism as to the logic of trying to spread all the way from basic production to the consumer's doorstep was expressed in conversation by the representative of a farmers' co-op group. It struck him as quite amusing for one of the big basic insecticide producers to send its trucks 20 or 30 miles to make delivery of a 50 or 100 pound container of insecticide to a small farm buyer. He was quick to point out that his own organization sells feed, fertilizer and a dozen other materials to such buyers, and can deliver the few additional pounds of insecticide for a fraction of the cost.

Still another contributor to our informal symposium on the subject pointed out that the fertilizer trade went through the same phase a number of years back and learned some of the basic facts of life the hard way. A large segment of the fertilizer industry finally decided that in most cases, basic manufacturers do better when they stick to manufacturing; that there is real economic justification for the formulator; that distribution is properly and efficiently the function of the distributor; and that the dealer is normally in the best position to serve his customers and himself if he can draw the products he chooses to market from a wide range of basic producers and not be reduced to the sterile role of selling a single line of products which may or may not always meet the changing demands of an extremely volatile market.

Maybe the big boys in the insecticide industry are going to prove they can modify some of these basic facts, and take the top dollar from the consumer's hand, while by-passing the hands in between. But they might do well to pause and consider what can be learned from this revealing experience of the fertilizer industry, when they tried out similar ideas. The facts of life have a way of being just as true today as they always were.

As a matter of fact, the entire insecticide industry might learn a few important sales facts from their counterparts in the fertilizer trade,—one of the most important being that the future of the insecticide industry lies in expanding the total business,—and not in fighting for already existing markets.★★

## Profits Essential to Healthy Industry
## Expanding the Markets for Herbicides
## Better Farming with Soil Insecticides

# . . . Discussed as

THE first duty of the manufacturer, distributor, dealer or retailer of agricultural chemicals is to make a profit, since on a long term basis "in this business as in all others, the existence of each depends on performing a necessary function and getting paid for it." This timely reminder was addressed to members of the National Agricultural Chemicals Association by John L. Gillis, Monsanto Chemical Co., St. Louis, as the N.A.C. met for its annual spring meeting in St. Louis, March 7-9.

Continuing this same train of thought in his address under the title, "Disorder Out Of Chaos," Mr. Gillis suggested that what each type unit receives for its efforts "depends on how much the function performed is worth to the ultimate consumer."

The program featured several panel discussions: one dealing with the future of herbicides, one with the future of soil insecticides, and a third on how the industry can operate efficiently when the Miller Bill goes into effect on July 22nd. The expanding market for pesticides in protecting stored grain and the farmer's view on use of agricultural chemicals were also discussed in the three-day business program, with sessions exceptionally well attended.

Mr. Gillis' talk emphasized the necessity for competitive, but rational selling. He reminded his listeners that many problems of the industry, "especially selling problems, stem from self-delusion. When the balance sheets shows us something is wrong, we haven't sought true causes, but have taken the easy way out . . . cutting the price some more." Mr. Gillis suggested that "perhaps the first step toward bringing disorder out of chaos is to assert our responsibility to do our own selling job and to get paid for doing it." (A more complete review of Mr. Gillis' remarks appears on pages 37-38 of this issue of *Agricultural Chemicals).*

Hon. True D. Morse, Under Secretary of Agriculture, Washington, D. C., guest speaker at the NAC luncheon banquet, pointed out that "Constructive selling by industry has been a powerful educational and extension force. It is a major reason," he said, "why agricultural chemicals are being used increasingly." He detailed the extent of annual losses to crops, pastures, ranges, livestock, and products, which, he said, total over $13 billion dollars annually and represents agriculture's order for chemicals to control these losses: insects destroy $2 billion worth of crops; weeds annually reduce crop values over $2 billion; plant disease cost is almost $3 billion; and $2.5 billion worth of farm animals and animal products are lost due to diseases, parasites and insects.

Mr. Morse reminded that timber-killing insects are a worse foe than fire; but that insecticide concentrates applied by aircraft and mist blowers have been effective in controlling timber pests over wide areas. This is only one illustration," he said, "of the way in which chemical treatments will be extended over greater areas in agriculture."

There is great need for more research, Mr. Morse told NAC representatives. We need more information on: the effect of soil insecticides on crops; an understanding of how antibiotics produce the results they do; effect of systemics on seed germination and their effectiveness in relation to climate, soils, and stage of growth of the plant; whether control of range and grassland pests with insecticides is economically practical; etc.

"In this era of surplus crops storage and long range transportation," he continued," we need new chemicals that will protect crops when they are being stored and moved. We need more effective rodenticides and new protectives. "Defense measures may require holding of larger quantities of food and over longer periods of time. More answers will be needed on how to protect and preserve any such foods."

Meeting the chemical needs to protect these stored supplies obviously represents a further potential for the agricultural chemical market.

AN ominous note of depression was sounded in the remarks of F. V. Heinkel, president, Missouri Farmers Association," in a report on "Farm Chemicals. . . . The Farmer's Viewpoint." Mr. Heinkel pointed out that farmers are coming to depend as much upon agricultural chemicals for

# N. A. C. A. Meets

controlling insects and other pests as they do upon good fertilizers for improving their soil . . . Furthermore, the farmer cannot farm without a sizable capital outlay (invested in machinery and equipment) . . . and then must spend more cash for gas and oil, agricultural chemicals, fertilizers, etc.

Addressing a direct warning to manufacturers of agricultural chemicals, Mr. Heinkel said "Your business depends directly upon the economic status of farmers. Farmers aren't doing so well financially these days, and your business is going to suffer accordingly. From 1951 to 1955 the price of farm products has gone down 25 per cent. In 1947 net farm income was $16.8 billion; last year it was only $12.5 billion. Many farmers have already quit, and many others are broke. I cannot understand why so many people in this country refuse to recognize that there is a depression in agriculture.

"Tens of thousands of farmers are now living out of capital because they are not receiving cost of production for their products."

"This farm depression is certain to be felt more keenly, month by month, by all industry. First to feel the pinch are those industries that directly serve farmers, such as manufacturers and distributors of farm chemicals, farm machinery and fertilizer, some of whom are beginning now to cut one another's throats with price wars."

"I don't know how much longer the farm depression can go on without its bringing the whole economy down into an abyss, as happened back in the 1930's.

Mr. Heinkel offered suggestions on countering the farm depression he described. He *advised that*,"

"What the farmers need in order to stay in business and be good

(1) E. D. Witman, Columbia-Southern Chemical Corp., Pittsburgh; Jack V. Miller, Atlas Powder Co., Wilmington; George Ahl, Jr., Summit Mining Corp., Carlisle, Pa.; and Arthur Northwood, Jr., Shell Chemical Corp., New York.

(2) Eugene S. Heckathorn, Heckathorn & Co., Richmond, Calif.; Paul D. Torpin, McLaughlin Gormley King Co., Minneapolis; Z. Z. Dworkin, Fairfield Chemical Div., Food Machinery & Chemical Corp., New York; Melvin Goldberg, Pesticide Advisory Service, New York; and G. F. Kerbey, Fairfield.

(3) H. L. Haller, U.S.D.A., Washington, D. C.; P. H. Groggins, Food Machinery & Chemical Corp., Washington, D. C.; Jack V. Vernon, Food Machinery & Chemical Corp., Middleport, N. Y.; and R. B. Stoddard, Food Machinery & Chemical Corp., N. Y.

(4) R. W. Breidenbach, Commercial Solvents Corp., New York; John Van Geluwe, G. L. F. Soil Bldg. Service, New York; E. F. Huckstep, General Chemical Division, Allied Chemical & Dye Corp., New York; Mervin H. Nabors (seated), Tennessee Products & Chemical Corp., Nashville; and Ed. A. Georgi, United Cooperatives, Inc., Alliance, Ohio.

(5) C. E. Griffith, R. W. Greeff & Co., New York; Carlos Kampmeier, Rohm & Haas Co., Philadelphia; John C. Long, Virginia-Carolina Chemical Corp., Lancaster, Pa.; and J. M. Merritt, Virginia-Carolina Chemical Corp., Richmond, Va.

(6) Clark Bellamy, Acme Fertilizer Co., Wilmington, N. C.; Jack W. Moore, Floridin Co., Tallahassee, Fla.; John A. Rodda, Fairfield Chemical Division, Food Machinery & Chemical Corp.; New York; and A. G. Raufer, Michigan Chemical Corp., St. Louis, Mich.

(7) C. P. Zorsch, Monsanto Chemical Co., St. Louis; T. W. Brasfield, Naugatuck Division, U. S. Rubber Co., Naugatuck, Conn.; and Lea Hitchner, N.A.C.A., Washington.

(8) Wayne Yoder, American Cyanamid Co., New York; B. Thomas Snipes, Chemagro Corp., New York; and Scott James, Pittsburgh Coke & Chemical Co., Pittsburgh.

(9) R. W. Wert, Attapulgus Div., Minerals & Chemicals Corp.; Douglas Bennett, Phelps Dodge Refining Corp., New York; and S. Epstein, Emulsol Chemical Corp., Chicago.

(10) J. H. Kennedy, Stauffer Chemical Co., New York; Robert A. Lamoree, Stauffer Chemical Co., San Francisco; and P. Macaluso, Stauffer Chemical Co., New York.

customers of industry is to receive parity prices for their products. The way to accomplish this is to get our small surpluses consumed. These small surpluses demoralize the prices of our whole production. We need to get them consumed by the people who need them the most.

"I believe" he said, "that this objective could best be accomplished by means of some kind of food stamp plan" . . . . in which the Federal government would issue food stamps to low income groups, etc. . . . the stamps being redeemable for food products which the Secretary of Agriculture determined to be in surplus.

After detailing the proposed food stamp plan, Mr. Heinkel appealed to NAC members to cooperate in alleviating the farm situation.

A REALISTIC Outlook on Farm Chemicals" from the viewpoint of industry was presented by NAC president, W. W. Allen, Dow Chemical Co., Midland, Mich. Reporting that "We are going to have new chemicals and new applications of which we have not yet dreamed," Mr. Allen cautioned that "markets for many of the present products are shrinking because of the approach of these new materials, and because insects or fungi develop resistance to materials being used."

"We have large potential markets to be developed by education and merchandising." Mr. Allen reported, "But rapidly declining prices and profits for us and our customers are such that no one can spend the time and money required to sell the farmer on using products that in turn will make him more money. Our only sales tool often seems to be a lower price and unlimited credit."

Mr. Allen endorsed the comments of other speakers that education of the public is an important factor in the agricultural program. However, he also emphasized the obligation to educate the distributors and dealers through whom agricultural chemicals are sold. "At this point" he remarked, "I refer specifically to our credit policies. There are times when I wonder whether we are chemical manufacturers or bankers, or perhaps a cross between the two which bears no name.

"There must always be a certain amount of give-and-take between sources of supply and channels of dis-

tribution. Credit is an indispensable part of the conduct of modern business. Yet there comes to be a time when operation of unusual credit systems becomes a greater burden than the production and distribution of chemicals."

Pricing and financing agricultural chemicals which reach the farmer through dealer and distributor channels, have long offered difficult problems to the industry. Mr. Allen suggested that it is time manufacturers take a thorough look at the policies of unlimited price protection, the length of terms for payment offered the outlets for agricultural chemicals, and the whole practice of consignment selling. Without proposing any specific solutions, Mr. Allen suggested he knew of many banks who would be more than interested in assuming some of the financing of certain agricultural chemical industries. He asked his listeners that his remarks not be misconstrued as advocating "stiff-arming distributors or dealers" . . . however, it might be helpful to distributors and dealers to reexamine their own policies of accepting or requesting credit. "Their interests must be considered along with ours," he concluded, "as we take a fresh view of our credit policies."

**Soil Insecticide Symposium**

PEOPLE in the best position to judge say that average crop yields can be increased at least ten per cent by the elimination of soil inhabiting insects," NAC members were told by Dr. George C. Decker, University of Illinois, Urbana, Ill., who moderated a panel on "Better Farming with Soil Insecticides."

"The advent of DDT, chlordane, aldrin and many other synthetic organic insecticides marked the dawn of a new era in this neglected field," observed Dr. Decker, "and control of many soil inhabiting insects has already been succesfully demonstrated."

Discussing soil insecticides as crop insurance, J. H. Lilly, Iowa State College, Ames, Ia., remarked that in Iowa, lindane has been the leading material for farmer applications in seed treatments to control seed corn maggots, seed corn beetles, and wireworms. He said too, that in 1955, for the first time, seed corn is being treated commercially with low dosages of dieldrin by some producers.

"Insecticide - fertilizer mixtures used as starter fertilizers have been popular" reported Dr. Lilly," because low dosages are used, and no extra work or equipment is required. Spray applications made with ordinary farm sprayers appeal to other farmers, and some early tests indicate that they give control for two years."

There are two different ways to develop the soil insecticide field, suggested Dr. Lilly: first is the use of very low dosages of insecticides applied to the seed before planting; the second is the direct application of in-

(11) Dr. W. E. Dove, Food Machinery & Chemical Corp., New York; J. M. Taylor, Taylor Chemical Co., Aberdeen, N. C.; A. F. Bixby, Pennsylvania Salt Mfg. Co., Tacoma, Wash.; H. J. Grady, California Spray-Chemical Corp., Washington, D. C.; and J. Smillie, Wm. Cooper & Nephews, Inc., Chicago.

(12) Kenneth Cloaninger, Columbia, Mo.; J. E. Bussart, Velsicol Corp., Chicago, R. E. Hammon, Shell Chemical Corp.; K. B. Nash, John Powell & Co., Division of Olin Mathieson Chemical Corp, New York; and F. J. Luthi, Shell de Mexico.

(13) George Simches, Planters Chemical Corp., Norfolk, Va.; Melvin Clark, Frontier Chemical Co., Wichita; J. B. Maddrey, Planters Chemical Corp., Norfolk, Va.; and Dick Yates, Hercules Powder Co., Wilmington, Del.

(14) C. G. Whinfrey, Pennsylvania Salt Mfg. Co., Aurora, Ill.; A. F. Fuchs, Diamond Alkali Co., Cleveland; W. Mercer Rowe, Jr., Ashcraft-Wilkinson Co., Atlanta, M. E. Williams, Stevens Industries, Dapson, Ga.; and L. J. Polite, Jr., Diamond Alkali Co.; Cleveland.

secticides on or in the soil. He observed that soil insecticides tested and proved for control of corn rootworms include: aldrin, heptachlor, dieldrin, BHC, endrin, chlordane and lindane.

Panel member, Charles C. Compton, Shell Chemical Corp., Denver, Colo., observed that soil pests are not limited to those that spend all of their time in soil . . . as, for example, the rootworm; but that soil infesting pests include also such insects as thrips, aphids and spittlebugs, which spend relatively little time in the soil. Dr. Compton remarked that "crop destroying insects that spend very little time in the soil can still be destroyed by insecticides applied directly to the soil instead of to the plants."

Dr. Compton said that initial studies with the insecticides (in conventional formulations) indicate that wettable powders, dusts, emulsifiable concentrates, and in a few instances, oil solutions, give good control of insects if the products are applied correctly. "Mixing the insecticide with fertilizer," he said, "has proved one of the most economical and popular ways of doing the job." The development of the new chemical products has been accompanied by a rapid development of new equipment for applying the insecticides, NAC members were told. Among the new types of equipment for application are: a device attached to seeders that drills granules into soil along with the seeds; spraying equipment applying in bands along rows at the time of seeding; distributing equipment for ground application of granular formulations and the use of airplanes in distributing both liquid and granular formulations on a broadcast basis.

Also speaking as a member of the panel on "Better Farming with Soil Insecticides," Dr. Oscar N. Allen, University of Wisconsin, Madison, Wisc. remarked that studies in progress on Wisconsin soils show that the vitally important populations of microorganisms in the soil are not affected by normal applications of certain insecticides. He stressed the relationship between the new agricultural chemicals and the microbiological aspect of farming because the microorganisms are so important in supporting plant life.

"There are between two and two and one half tons of the microorganisms in the top six or seven inches of every acre of fertile soil," Dr. Allen said. "They account for 95 per cent of all the biological reactions that take place in the soil they occupy. Without them, the soil would be "an inert mass of weathered materials."

To give farmers continued benefits from recent advances in the development of new insecticides, Dr. Allen suggested a long term program of research on the relation between the chemicals and the microflora in the soil. He proposed also cooperative projects among entomologists, soil scientists and microbiologists to obtain maximum profit from long term studies.

**Better Farming with Herbicides**

OPENING the panel discussion on herbicides, moderator, Jack Dreesen, NAC Association, Washington, D. C., outlined briefly the proposal of the Western Agricultural Economics Research Council for a grant to study the economics of weed control.

M. W. Parker, USDA, Beltsville, Md., reviewed the herbicide research program at Beltsville, pointing out that current investigations center on four projects: (1) evaluation of new chemicals as herbicides; (2) a study of the relation between structure and activity, (3) physiological studies on the mechanisms of herbicidal activity, and (4) the absorption and translocation of herbicides in plants.

"At present," he said, "work is directed toward a systematic study of families of compounds or related compounds to determine the relation between molecular structure and herbicidal activity."

Dr. Parker observed that a recent report on a survey made in 1952 by personnel of the Agricultural Research Service and the Marketing Service indicates that about 60 million acres of farm crops in the United States were treated one or more times for the control of weeds, insects and diseases in that year. The area treated, he said, amounted to more than one-sixth of the acreage of the principal crops harvested in 1952.

A significant point on the potential market for herbicides was brought out by panel member Robert D. Sweet, Cornell University, Ithaca, N. Y. Dr. Sweet commented that when acres of cropland treated are used as a basis of comparison, herbicides outrank fungicides and insecticides. However, in predicting market potentials for herbicides, certain factors such as dollar value of the crop have too often been overlooked and undue emphasis placed on mere acreage. "This," he said, "can be a disastrous mistake."

Dr. Sweet pointed out that while about 85 million acres are planted in

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**This Month's Cover**

Top Left: Hon. True D. Morse, guest speaker.

Top Right:
John Kirk, Velsicol Corp., Chicago; J. F. McMurray, Jr., General Chemical Division, Allied Chemical & Dye Corp., New York; Theodore Riedeburg, Theodore Riedeburg Associates, New York; Roger W. Roth, Velsicol Corp., Chicago; and R. Peacock, General Reduction Co., Chicago.

Second from Top, Right:
Gordon Utter, Diamond Alkali Co., Cleveland; F. W. Hatch, Shell Chemical Corp., New York; James McConnon, McConnon & Co., Winona, Minn.; and L. Gardner, California Spray-Chemical Corp., Richmond, Calif.

Third Row:
John R. Stoddard, Prentiss Drug & Chemical Co., New York; C. C. Compton, Shell Chemical Corp., Denver; and T. Marvin, Michigan Chem., St. Louis.

Lower Left:
A. W. Mohr, California Spray-Chemical Co., Richmond, Calif.; Dr. W. G. Reed, USDA, Washington; George W Decker, University of Illinois, Urbana, Ill.; and W. W. Allen, Dow Chemical Co., Midland, Mich.

Lower Right:
E. H. Phillips, G. L. F. Soil Building Service, New York; W. J. Haude, Grace Chemical Co., New York; L. S. Kaniecki, Tennessee Corp., Atlanta; and F. M. Thompson, B. F. Goodrich Chemical Co., Cleveland.

Newly elected officers of the Potomac Division. Left to right: J. G. Leach, Vice President, University of West Virginia; H. Rex Thomas, President, Office of Experiment Stations, Washington, D. C.; W. D. McClellan, Councilor, Horticultural Crops Branch, Beltsville, Md.; L. O. Weaver, Secretary and Treasurer, University of Maryland.

# Potomac Phytopaths Elect Thomas

by *Paul R. Miller* and *Robert Rathbone*
USDA, Beltsville, Md.

A SYMPOSIUM, "Past, Present, and Future of Fungicides," highlighted the 12th annual meeting of the Potomac Division, American Phytopathological Society, at Beltsville, Md. on March 3-4 at the Plant Industry Station of the U.S.D.A.

Dr. G. L. McNew, Boyce Thompson Institute for Plant Research, pointed up the need for a new approach to research development of fungicidal chemicals. Dr. Hubert Martin, Science Service Laboratories, Canadian Department of Agriculture, described the factors underlying fungicidal toxic activity, and the necessity of considering the role of diseased plants as well as the chemical in the development of a fungicide. Dr. T. Walter Reed, California Spray Chemical Corp., listed the problems confronting an organization attempting to develop and market a new fungicide, and Richard J. Both, Hercules Powder Co., discussing the new Miller Bill (Public Law 518) which provides for the regulation of residue tolerances on food crops, said the Bill could provide an important degree of public protection if supported by all individuals and organizations concerned with the development of new agricultural chemicals.

At the annual banquet meeting, Dr. Karl Butler, Farm Counselor for AVCO Corporation, urged plant pathologists to work with other agricultural scientists and "plan for the future." He advised that much of this concerted effort be channelled into "chemicals and mechanization."

The first day of the two-day session featured reports and discussion of plant disease research that had been carried on by members of the Potomac Division during the past year: Dr. McNew observed that plant pathologists can best meet their responsibilities to our rapidly expanding population by developing ways of saving half the food now lost to plant diseases. In present-day terms, this would be the annual production of nearly 15 million acres — a $1.4 billion contribution.

"The development of better disease-fighting chemicals holds the answer, he remarked. These would include:

1. Superior food and feed crop protectants such as fungicides and seed-treating chemicals.

2. Chemotherapeutants — healing chemicals — based on entirely new principles.

3. Better soil-treating chemicals for the control of soil-infesting diseases.

4. Chemicals that can induce resistance to disease in plants.

These developments are within the scope of a concentrated research program involving the integrated efforts of our nation's plant pathologists and organic chemists, Dr. McNew said.

Tracing the history of chemical development in plant disease control, the noted research administrator said that the modern era of organic chemicals for plant disease control dates back only to 1934 when dithiocarbamate fungicides were first announced. Although this event heralded rapid progress in the development of fungicidal plant protectants, the potentials of chemical control have been barely tapped.

Our modern organic chemical fungicides provide excellent spore penetration, but little else, Dr. McNew said. They are rather poor toxicants — requiring concentrations in the range of 100 to 10,000 parts per million to destroy fungi. They are generally unstable, losing their toxic qualities soon after they are sprayed or dusted on crops.

The rapid development of better chemicals is necessary if plant disease losses are to be halved," he said. The empirical methods now in use in the search for better chemicals must give way to greater research efficiency. Our nation cannot afford the cost nor the time it takes to find one effective material by testing 2,000 — normal with today's procedures.

"We must learn to call our shots,"

Hubert Martin, Science Service Laboratory, Canadian Department of Agriculture; Richard J. Both, Hercules Powder Co.; J. W. Heuberger, Moderator of the Symposium on Insecticides, University of Delaware, and Retiring President of the Potomac Division; G. L. McNew, Boyce Thompson Institute for Plant Research; T. Walter Reed, California Spray Chemical Corp.

he said. To do this, we must conduct our search for chemicals with their architectural design in mind.

Fungicidal research, for example, can be fitted around three primary specifications for chemicals: 1. penetration into spores; 2. impairment of spore vital processes without excessive loss of toxicity, and 3. logistic acceptability — completeness of coverage and persistence of the material on a surface protected by spray or dust.

In support of his contention that the role of the plant must be considered in fungicidal action, Dr. Martin told of recent tomato research conducted at the Science Service Laboratory in London, Ont. This research compared the relationships between the normal growth pattern of the host plant and its susceptibility to fungus attack. Treating soil with 2,4-D caused wilt-susceptible tomatoes growing in the soil to become less susceptible to the disease. Treating a wilt-resistant variety in a similar manner after the plants had been inoculated with wilt fungus increased their susceptibility. Soil treatments with maleic hydrazide gave opposite effects.

In other preliminary work at the London laboratory, researchers found that they could induce resistance to wilt in a susceptible tomato variety by infecting the tomatoes with the virus of potato witches broom.

Dr. Reed said that in the discovery and development of new fungicides two questions eventually arise: Will it work? Will it pay?

It has to "work" — perform as an effective fungicide — to gain consideration for market development, but how well the material will "pay" the grower to use it provides the biggest problem. Dr. Reed said that generally, "if it doesn't return the grower about $5 for every dollar invested, it will be an 'also-ran' instead of a winner." A chemical industry can't absorb many million dollar "also-rans."

Then, Dr. Reed stated, comes the enigma of getting a new fungicide into production quickly. High volume production and low cost depend on public acceptance, and generally, public acceptance depends on high volume production, with resultant low cost.

He listed "compatibility" determinations as one of the big industrial research jobs connected with the development of a new chemical for the market. The material must not only be effective when used alone, but must remain effective in combination with other chemicals — insecticides and plant growth regulators — which are often teamed in spraying or dusting schedules.

Finally, comes the problem of registration under the Federal Insecticide, Fungicide, and Rodenticide Act. Industry is charged with the responsibility for proof of the effectiveness, the toxicity, and the residual qualities of their chemical. Such proof must cover a wide range of uses and conditions. Toxicological information often takes years to obtain.

Dick Both, discussing the legislative aspects of marketing chemicals, reported on industry-enthusiasm for the Miller Bill, which for the first time provides the Federal Food and Drug Administration with an effective, speedy way to set tolerances on chemicals to be used on raw foods moving interstate.

"Industry is also a part of the public," he explained, "and is eager to see established a workable way of preventing the occurrence of unwanted chemical residues on food."

Mr. Both observed that the Miller Bill would not substantially alter the research programs of either industry or government. Instead, he said, it provides "tolerance targets" for these organizations to shoot for during the development or testing of a new chemical.

The Bill requires researchers to keep in mind: 1. The residue to be expected from normal use of the chemical; 2. The toxicity of the residue; 3. How use of the chemical in regular spraying or dusting schedules keeps the residues within the tolerance limits.

Karl Butler told the plant pathologists that research in the fields of agricultural chemicals and mechanization offers the best means of helping fewer farmers grow more food for more people.

The need for better chemicals is clearly apparent in the yearly multi-billion dollar losses to plant diseases, insects, and weeds. How badly mechanization is needed was shown by Dr. Butler with this example: The United States produces as many tons of hay as steel each year. Steel is highly mechanized; but 30 per cent of the hay crop is still handled by hand and 64 per cent is baled, requiring some hand work.

Since there is little more land in this country that can be exploited for food production, our farmers must depend upon new methods and materials that will help them grow more on the land they have. Dr. Butler pointed out that acreage of harvested crops hasn't varied 2 per cent in 30 years. As new farm lands are developed, the gain is offset by suburban development of established farmlands.

**New Developments Reported**

IDENTIFICATION of two distinct carnation virus diseases was reported by Dr. Philip Brierly, plant pathologist, and Dr. Floyd Smith, entomologist, U. S. Department of Agriculture. The two diseases, which have been thought to be a single disease, are carnation mosaic and carnation ringspot virus. The mosaic virus is transmissible by sap and by an aphid; the ring spot virus is transmissible by sap but no insect vector is yet known.

A. C. Goheen, M. T. Hutchinson, and E. H. Varney of the New Jersey Agricultural Experiment Station, presented proof that stunt virus disease of blueberries is present in several native plants, including wild blueberries. Previously, this disease was believed to occur only in the domestic fruit. Their findings will likely alter cultural practices so that blueberries will no longer be grown near the native hosts of stunt virus.

Dr. George M. Darrow, USDA horticulturist, reported on the continuous fight strawberry breeders have waged against leaf variation disease. Apparently due to an unstable, ever-mutating gene that occurs widely in strawberries, the disease now causes trouble with only one popular U. S.

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# PROFITS . . .

## the first responsibility of the Agricultural Chemical Industry*

*By John L. Gillis*
Monsanto Chemical Co.
St. Louis, Mo.

Whether we like it or not, the agricultural chemicals industry is looked upon as a problem industry. A bright, precocious, promising child in the chemical family—but definitely a delinquent. Our behaviour has been diagnosed as manic depressive, with sometimes a hint of suicidal tendencies.

Of course our industry has its problems. They are real problems, and I don't intend to make light of them nor pretend they don't exist. But we simply have to stop living in the days—even though they were wonderful days—when DDT sold for $1.25 a pound and there wasn't nearly enough to go around.

Our task now is to face the present and the future. And the facts we have to face aren't bad—not too bad at all.

It isn't as though we were selling buggy whips to an ever-dwindling carriage trade. Our business should be booming. It's as basic as food itself. Our customers, American farmers, are expected to produce a better diet for more mouths than history has ever known. Since we are reaching the limit of arable land, the farmer must raise more food per acre. With labor costs rising and with price supports uncertain, he must produce it more efficiently.

These are not new facts and I don't intend to belabor them. I recite them here to remind you that our industry is basically sound. We begin from a solid footing in building disorder from chaos.

It's some comfort to know we are not alone in our chaos. Consider the problems faced by those marketing room air conditioners this year. The television industry too is still in some disorder.

It wasn't many years ago that the plastics industry was in equally bad shape. The quality of finished products dropped so low that many retailers practically refused to carry any plastics merchandise—even at cut-rate prices. To its everlasting credit, the plastics industry, through its constructive program of raising standards, is bringing itself out of chaos—back into the respect of the buying public.

And look at the disreputable beginnings of the pharmaceutical industry. Recall the traveling medicine man. Today, by sharp contrast, the drug business is well-ordered. There are literally hundreds of competitive companies selling proprietary and ethical pharmaceuticals through wholesale and retail drug outlets. The manufacturer makes a profit, the retailer makes a profit. We could certainly learn a lesson or two from them.

The larger drug companies have made great contributions to medicine. These are the firms which have brought forth the antibiotics, the cortisones and other wonder drugs. But they don't succeed simply because they are large. Nor do others fall behind because they are small. That's why I can't take too seriously this big company versus little company argument. I can't forget that for every Goliath there seem to be plenty of sharp-shooting Davids around.

The real issue is this: **long term, in this business as in all others, the existence of each of us depends on our performing a necessary function and getting paid for it. How much any of us is paid depends on how much the function he performs is worth to the ultimate consumer.**

For example, take the sales and distribution function. All of us know that marketing costs are just as concrete as manufacturing or research or any other costs. The formulator or distributor or retailer who performs these functions is entitled to recover these costs and enjoy a reasonable profit on the capital and effort he has invested.

It sounds elementary, of course. But our industry hasn't been working that way. We think nothing of short-circuiting the merchandising function—and frequently short-changing ourselves in the process.

Some companies, for example, bypass the distributor and sell direct to the retailer or even the farmer. Some distributors want to formulate, and some formulators want to manufacture. I am not saying that any of these practices are right or wrong, but I do think that whoever performs the distributor's function, for example—maintaining local stocks, detailing retailers, etc.—should charge a price which recognizes the cost of his effort and pays him a profit. Likewise, when a distributor or formulator flirts with production to try to better his position, he should be just as realistic in arriving at his cost and earn a profit on these costs.

Many of our problems, especially our selling problems, stem from self-delusion. When the balance sheet shows us something is wrong, we

*Based on a talk delivered March 7th at the annual spring meeting of the NAC at the Chase Hotel, St. Louis, Mo.

haven't sought true causes, but have taken the easy way out—cutting the price some more.

This short-sighted practice has brought the price of DDT, for example, farther and farther down during the period when its value to the farmer has increased.

I am not arguing for high prices—and particularly not for artificially high prices. I realize too that in our industry prices will be regulated not only by demand, but by such vagaries as weather and insect behavior, not to mention increased competition from new products. But in the case of DDT which is still one of the most effective all-around insecticides, lower prices have not meant increased volume: In fact just the opposite occurred—probably because inadequate profits didn't support adequate education and promotion. The history of BHC has been just as melancholy.

Let's apply the ultimate test to our past selling policies. Has the farmer benefited? At first glance it might appear that he has, but long-term he has not. For one thing, he hasn't always had the service that he could expect if the suppliers were operating on a profitable basis. The farmer has often found local inventories suddenly depleted when infestation strikes his neighborhood.

Secondly, when a supplier doesn't make a profit he becomes unwilling to devote the time and effort necessary to expand application research and to bring out new products. This lack of new products could be disastrous to the farmer, especially as insects become resistant to present insecticides.

Third, the manufacturer, the formulator, the distributor and the retailer of the abused products have all reduced their educational efforts. What happened to the demonstration teams which used to carry the story of these products county by county? These teams and their educational efforts enabled the farmer to evaluate new products under soil and weather and crop conditions closely approximating his own. He didn't have to conduct his own experimentation.

Nowadays this educational work is carried on, if at all, usually by state and federal agencies. I share the common high regard for the men and women who carry on this work, but I ask you what other industry has abandoned its promotional effort to governmental agencies so completely as ours?

It was encouraging to see the NACA organize the herbicide educational program. I urge continued support for it. But we can't look to the association nor the government nor the other fellow to do our real creative selling job for us. Perhaps the first step toward bringing disorder out of chaos is to assert our responsibility to do our own selling job, to do a good selling job and to get paid for doing it.

The manufacturing function also rates a profit. I speak as a manufacturer but, mark you, with an interest in every phase of this business. Regardless of what I may think or anyone else may think, whoever performs the manufacturing function most efficiently is on the firmest ground.

**It would appear that the small local firms have an advantage in selling agricultural chemicals because of their knowledge of local conditions, quick adaptibility to local demands and faster delivery.** Similarly, it would appear that the larger, more diversified, more basic companies have an advantage in the manufacture of chemicals. In most cases the larger the volume the lower the unit cost. Further, it takes capital to maintain the inventories that are needed in a business as seasonal as ours. Moreover, it takes a company with broad coverage to compensate for the variations in demand from region to region.

I know that many a formulator is looking at the possibility of manufacture as a way out of his present dilemma. We can only urge him to look long and hard before he makes the move, because the pastures are not nearly so green as they may appear from the sales side of the fence. Business prudence dictates that before taking on additional functions a man should make sure he is at top efficiency in what he is already doing. Our common interest should be to increase the size of the total market.

There is little for any of us to gain in fighting for a bigger piece of pie if the pie itself is getting smaller. Only renewed sales effort can keep the pie from shrinking.

Even the Davids seem willing to leave the research function to the Goliaths, and when I see some of our research bills I am inclined to see why. As Franklin P. Adams said, "The race is not to the swift nor the battle to the strong—but the betting is best that way." Without under-rating the research talents of some of our smaller firms, the odds are that the major new developments will come from our larger laboratories.

There are only a few firms which can support the expensive research necessary to bring forth new products. They must have the staying power to see them through field and toxicological and market testing. They must survive the average five failures for every research success.

It's no news that a new pesticide has a difficult time in childbirth. The labor is long and delivery is hazardous. And, the cost quickly runs into six or even seven figures.

But it is this constant supply of new research babies which carries with it the best hopes for the agricultural chemicals industry, and indeed for agriculture itself.

During the last few years Monsanto has doubled and tripled the money and manpower applied to research and development of new agricultural chemicals. Our 1955 budget is six times as large as in 1951. It is now one of the two or three largest research projects in our company.

In 1952 we established greenhouses, laboratories and an experimental farm just outside St. Louis. Literally thousands of new chemicals synthesized in our other chemical laboratories in St. Louis, Dayton,

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# The ILLINOIS NATURAL HISTORY SURVEY..

*By J. S. Ayars*
Urbana, Illinois

Top: Cornfield in which part of the field received soil application of aldrin at planting time and part of the corn crop (foreground) was left untreated in 1953.

Bottom: Duster used by Illinois Natural History Survey entomologists in 1943 experiments for control of European corn borer on sweet corn in east-central Illinois.

BACK in 1867, Parker Earle, President of the Illinois State Horticultural Society, declared, "The people of Illinois are today many millions of dollars poorer by reason of noxious insects. . . . A very large proportion of this loss might have been averted by the labors of a competent entomologist with a little means at his disposal."

Aroused by President Earle's remarks, the society at its annual meeting passed a resolution: "That we most urgently pray the honorable legislature of our great state to appoint a state entomologist, that agriculturists and horticulturists may not quite despair of ever overcoming the giant insectivorous difficulties in the way of success in their professions." Two years later the Illinois legislature created the State Entomologist's Office. In 1877, the legislature established the Illinois State Laboratory of Natural History to take over some of the duties of the State Natural History Society, founded in 1858. Dr. Stephen Alfred Forbes, director of the State Laboratory, in 1883 was appointed to head the State Entomologist's Office and continued as head of both organizations until they were merged in 1917 as the Natural History Survey Division of the State Department of Registration and Education. He served as chief of the new organization until his death in 1930.

If the materials and methods used by early Illinois biologists were crude, the thinking at least was on a level with the best of today's. Dr. George C. Decker, head of the Natural History Survey's economic entomologists, declares that many supposedly new basic ideas about insects and insect control can be found in the writings of Forbes.

At present, the main offices and laboratories of the Illinois Natural History Survey are in the Natural Resources Building on the University of Illinois campus at Urbana. Although not part of the university, the Survey co-operates closely with it and with its College of Agriculture, Agricultural Experiment Station, and Extension Service in Agriculture and Home Economics. Many types of research on insect control, plant diseases, fish, and wildlife that in other states are done by colleges of agriculture, experiment stations, or departments of conservation are in Illinois done by the Natural History Survey.

Except for about 15 months, the Illinois Natural History Survey has been headed by entomologists. Dr. Theodore H. Frison, a taxonomic entomologist, succeeded Dr. Forbes, and since March 1, 1947, Dr. Harlow B. Mills, well versed in both entomology and wildlife management, has been chief of this state research agency.

Largest and most spectacular of the insect control programs in which the Natural History Survey has played a major part is that involving the European corn borer. For 15 years before the borer entered Illinois in 1939, entomologists of the Survey were studying this insect in Ohio and Indiana.

Once in the rich corn country of Illinois the borer picked up speed in its spread westward, and by 1942 it had invaded all of Illinois except seven counties at the southern tip of the state.

Although use of certain cultural practices—including clean plowing, use of hybrids adapted to the area, and avoidance of early planting—helped to reduce the number of borers, damage was still so great that Natural History Survey entomologists turned to insecticides to supplement other control measures.

In 1943, dusts and sprays of rotenone and several other insecticides then on the market were tested

Dr. Harlow B. Mills, Chief of the Illinois Natural History Survey since March, 1947.

against the borer on sweet corn. The degree of control achieved was sufficient to justify further tests. In 1946, use of DDT in Illinois was extended to include spraying and dusting of commercial field corn. In 1949, a year of very heavy corn borer damage, many Illinois farmers who followed recommendations of Natural History Survey entomologists for use of insecticides obtained a degree of borer control that far exceeded cost of treatment. Reports from farm advisers showed that 521,940 acres of field corn were sprayed or dusted with DDT. This figure indicated for 1949 a saving to Illinois farmers of approximately 4,000,000 bushels of corn through use of DDT.

Natural History Survey entomologists emphasize that, although insecticides are valuable means of corn borer control, the chemicals must be used wisely and efficiently, and only when needed as supplements to other control measures.

**Chinch Bug Control**

THE long history of efforts to control the chinch bug in Illinois illustrates well the progress made by entomological research in the state and points up the value of modern insecticides. Periodic outbreaks by the chinch bug were once so devastating that, often in a spirit of desperation, entomologists as well as farmers turned to any measures that they thought might reduce the size of attacking hordes. Measures used at one time or another included burning of hibernating places of the bugs, constructing dust-furrow barriers, searing of bugs (on the corn plants) with gasoline blow torches, spraying of corn plants with emulsions of kerosene, solutions of whale-oil soap, or extract of tobacco, and building of barriers of road oil, coal tar, or creosote.

The creosote barrier, as it finally evolved, offered a comparatively effective control. But it was cumbersome, time-consuming, and dependent on weather. More effective and more economical chinch bug control waited on the modern organic insecticides.

In 1914, central Illinois farmers used 2,000 barrels of creosote and 1,000 barrels of coal tar to construct 1,500 miles of chinch bug barriers; at a cost of $40,500, they saved 1,191,187 bushels of corn that, at 60 cents a bushel, were worth $714,712. In 1954, Illinois farmers used dieldrin-sprayed strips, first tested experimentally in 1949, to check the worst chinch bug infestation of the present decade; at a cost of about $4 per acre, they sprayed nearly 69,000 acres to effect savings conservatively estimated at more than half a million dollars.

The recent history of grasshopper control in Illinois illustrates the benefits of a program the Natural History Survey has consistently pursude with respect to insects that have outbreak potentials but that in many years do little or no damage. For several years following the disastrous outbreak of 1936, grasshoppers did so little damage in Illinois that many farmers assumed these insects would never again menace their crops. Taking advantage of this period of low grasshopper populations, entomologists of the Natural History Survey tested a large number of newly synthesized compounds from the laboratories of chemical manufacturers. Materials that showed promise in laboratory tests they subjected to field tests in areas where small, localized outbreaks occurred.

Of necessity, entomologists of the Natural History Survey have directed their principal efforts toward the insects of greatest economic importance. But they have included in their research programs the less important, even the little known, species.

The value of such a practice was well demonstrated in the crop seasons of 1953 and 1954. Each of these seasons was preceded by a mild winter favorable to insects. Outbreaks started early in each growing season and continued, almost without interruption, into the fall. Insects usually of little or no importance in Illinois joined the perennially important species to complicate the problems of entomologists and farmers.

Early in the spring of 1953, evidence was found of potentially heavy damage to hay and pasture plants (red clover, alfalfa, and sweet clover) by the clover leaf weevil, the common pea aphid, and the meadow spittle bug.

Through experience gained in a three-year study of the new organic insecticides, Survey entomologists were able, in 1953, to recommend effective control measures for each of these insects. In this year, farmers who acted promptly and followed carefully the recommendations for use of the new insecticides treated more than 300,000 acres of legumes and saved hay and pasture crops valued at approximately $500,000. Some farmers, however, having had little experience in controlling insects of legumes, were hesitant to adopt the recommended control measures and lost thousands of acres of alfalfa and clover.

Although Illinois is not generally regarded as a fruit-growing state, large acreages of apples and peaches are grown in some of the southern counties. For many years, an entomologist of the Natural History Survey staff has been stationed at Carbondale, in the heart of the fruit-growing district. There he has been able to co-operate closely with growers in developing new and more effective controls against fruit insects or in adapting to Illinois conditions the effective controls developed in other states. Chlordane, DDT, dieldrin, and other organic insecticides have been tested, evaluated, and given places in the spray schedules where they could be of greatest benefit.

A staff entomologist assigned to insect problems of the truck-crop areas of northern Illinois recently worked out effective techniques for controlling the carrot weevil with DDT spray, the onion maggot with aldrin sprays or soil treatment, and the squash bug (a serious pest of pie pumpkins in commercial fields) with dieldrin spray.

A staff entomologist specializing in control of insects affecting man and other animals in 1950 designed and constructed a treadle sprayer that gave the first practical control of horse flies on range cattle. In 1953, he developed the hardened bait method for

(*Turn to Page* 123)

# Present Status of BORON in FERTILIZERS

Top Left: Boron deficient broccoli, right, and normal head, left, from field in Tennessee. Note decomposing head and stem on right.

Top Right: Correction of blossom blast and dieback of pears at White Salmon, Wash. with Polybor-2. Left: No boron; Right: 5 lbs/A Polybor-2 sprayed in fall 1952.

*Photo: Courtesy Western and Southwestern Agri. Exp. Sta., State College of Wash.*

Bottom Left: Alfalfa on boron deficient soils responds to boron in yield, quality and duration of stands. Left — Without boron; Right — Boron treated.

Bottom Right: Fruiting twigs from affected (left) and apparently normal (right) Pineapple orange trees. Note reduced size of leaves and fruit, misshapen fruit, gumming and general paleness of affected twig.

*Photo: Courtesy Dr. Paul F. Smith, U.S.D.A., Orlando, Fla.*

THE fertilizer industry by its competitive nature is concerned with producing and marketing the most efficient grades of fertilizer for their customers. During the last 10 to 15 years, the practice of "mineralizing" and "borating" fertilizer to supply needed trace elements has increased from small experimental amounts to a standard practice for many crops, and an annual use of thousands of tons of borax and other trace element materials as a component part of fertilizers. In fact, many of our fruit and vegetable crops such as apples, citrus, pears, beets, broccoli, carrots, celery, cauliflower, tomatoes, and many others are unmarketable in some soil areas unless they are fertilized with boron. Furthermore some field crops such as alfalfa, clovers, sweet potatoes, sweet corn and seed crops in large areas yield poorly, stands deteriorate, and quality is reduced unless they are properly supplied with boron.

Fortunately, the cost of borating fertilizer is very low since borate materials are inexpensive, and the amount of boron required per ton of fertilizer ranges from 10 to 100 pounds, depending on the crop and soil type. Since high grade fertilizer borates are now available, the cost per acre to the farmer for the added boron is relatively small, usually amounting to 25c to $1.00 per acre annually.

Thanks to the teamwork of agricultural scientists, the general areas of boron deficiency are now known (see map). The eastern half of the U. S., the Pacific northwestern states, and the provinces of Canada are known to have boron deficient soils. Likewise, these are the areas of highest present fertilizer consumption. Some states, notably New Jersey and South Carolina, have suggested that every ton of fertilizer carry a minimum content of boron to avoid marginal deficiency of boron. In this connection, it is known that at least one manufacturer selling in several states has adopted the practice of adding five pounds of borax to every ton of fertilizer with good results. Many

(*Continued on Page 121*)

*By James A. Naftel*

Pacific Coast Borax Co.
Auburn, Ala.

**Fruits & Nuts**
apples
citrus
pears
nuts

**Truck or Vegetable Crops**
beets
carrots
celery
general

**Field Crops**
clover, crimson, white
alfalfa
cotton
tobacco

**Boron Deficiency Areas in the U. S.**

# Use of Agricultural Chemicals

CHEMICALS will play an important role in the agricultural development of tropical areas. Leading farmers in the Philippine Islands are recognizing this fact whether they be industrious landowners using hundreds of tons of fertilizers each year, or humble tenants with knapsack sprayers on their backs, fighting insects, diseases, rats and weeds. Just as in the United States, however, research has been and is still necessary to determine which chemicals to use and how and where to apply them.

A few illustrations of the results of research and need for more of the same can be cited from the work of the Central Experiment Station of the University of the Philippines College of Agriculture. First, however, it may be desirable to point out the unique position this station under the direction of Dean L. B. Uichanco, has held during the past few years. When MSA (now FOA) funds were first made available to the Philippine government, one of the early recommendations was that the U. P. College of Agriculture at Los Banos be strengthened both as a teaching institution and as a research center. In order to help make these plans a reality, Philippine and U. S. funds were used to restore burned buildings, purchase supplies, and to rebuild a depleted staff. In addition, a contract was drawn with Cornell University whereby the latter institution would furnish at first 10 and now 14 American professors to assist the local staff in expanding the Institution and its services. The contract has been in effect for more than 30 months now and during this time some rather interesting research results have been obtained.

For example, let us take the case of coffee production and the part the College's chemical research is playing in its augmentation. The Philippines, with their 7,000 islands, formerly produced plenty of fine coffee. Many millions of dollars worth were shipped to Spain back in the 1880's. Climate, soil and rainfall were ideal. Then came the rust fungus, *Hemileia vastatrix* out of Africa, thru India and Southeast Asia, laying waste most of the Arabica coffee plantations of 32 countries—all but those in Central and South America.

The coffee industry of the Philippines never recovered. Today they import about two million dollars worth of South American grown coffee because they do not grow enough of the better quality varieties for their own needs. The high local retail price ($2.75 per lb.) together with the promise of more resistant varieties, and the reputed efficacy of modern spray practices is luring capital back into coffee production. The Philippine government is offering liberal loans at attractive rates and plans to help with sales of seedlings at cost (2.5 cents) in sufficient quantity to plant 20,000 acres a year for 5 years. The same financing facilities are being offered to prospective cacao growers. There is a small, scattered but lucrative cacao-growing industry which could be expanded very profitably, even if only for local consumption of the 20 million people in the islands.

The success of this coffee and cacao expansion program depends very largely upon control of coffee rust and of cacao pod rot and insect damage. Sufficient seeds or cuttings of resistant varieties will not be available for several years. Even then strains of rust may develop which will attack varieties classified as resistant at the present time. Consequently, researchers at Los Banos are investigating spray and fertilizer practices by which relatively rust-free coffee can be grown.

To find out something about sprays, five applications of eight fungicides were applied to 2-year old coffee trees between June 22 and

**TABLE I**

**Percentage of leaves with coffee rust after five applications of spray. June-September 1954**

| | | | |
|---|---|---|---|
| 1 | Check | | 53% |
| 2 | Kolospray No. 437 (Sulfur 76% + Phygon 3.5%) | 3 lb.-100 | 55% |
| 3 | Tersan 75 | 2 lb.-100 | 46% |
| 4 | Kolo Carbamate No. 47 (Ferbam 10% + S 25%) | 1 lb.-100 | 38% |
| 5 | Captan (Orthocide 50) | 3 lb.-100 | 31% |
| 6 | Manzate | 2 lb.-100 | 29% |
| 7 | Yellow Cuprous Oxide | 1½ lb.-100 | 19% |
| 8 | Bordeaux 5-5-50 | | 4% |
| 9 | Calcium Sulfamate* 38 gr + 16gr/gal | | 2 |

*Leaves badly burned by third application and many dropped off.

**Facing Page:** One of the responsibilities of the Cornell contract professors is to train young men and women in methods of carrying out research. The senior author is shown instructing a group of advanced undergraduates in methods of applying soil fumigants.

**Photo Below:** Phosphorus-deficient soil areas are found in the Philippines. The men are standing in a corn plot which received ample nitrogen (90 Kg N per hectare) but no phosphorus. The corn in the background had received both N and P.

# in the Philippines

*By A. G. Newhall*
*and*
*N. C. Brady*
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September 28 (rainy season). In October, counts of the percentage of rusted leaves revealed that the copper fungicides were far superior to the organics and the sulfurs were of no benefit (Table 1). Whether better inherent toxicity, longer stability, better adherence, or all three were responsible for the good showing made by Bordeaux and cuprous oxide remains to be determined by further tests with stickers, now in progress.

These data indicate that growers can economically control rust. (Table 1) One grower estimates that spraying with 4-4-50 (Bordeaux) will not increase coffee costs more than 3 cents a pound. Even if this cost is doubled, it will not be prohibitive.

One of the favorite fruits in the Philippines is the mango. It is now on the market 6 or 8 months of the year. Early and late season fruits command fancy prices. Spraying, therefore, to keep down insects attacking the young fruits has been found to pay very well, and several custom spray rigs have made their owner operators a nice living on the basis of 15-20% of the crop for their remuneration. Some growers have bought small "estate" sprayers and one reports that his had paid for itself the first year.

The worst pest of the most important crop in this area of the world is the rice stem borer. The Japanese, and more recently, the Filipino entomologists, have found several of the newer insecticides of considerable value, such as endrin, parathion, and EPN. However, many Japanese farmers have been killed as a result of careless usage of the phosphates, and the Philippine Government is reluctant to advocate their use when so many farmers will feel they cannot afford the necessary precautions.

Recently, the National Onion Growers' Coop at Bongabon pledged P3000 ($1500.) for cooperative research by college and BPI investigators to find better controls for leaf diseases and insect pests. Work is starting on this in February and will be followed by weed control experiments as well as fertilizer experiments. The crop pays large dividends, but $100 an acre or 30% of the growing costs are spent on hand weeding. Acreage is increasing rapidly and a new cold storage will help in more orderly marketing of the current crop.

The college has two projects on spraying citrus nurseries and is cooperating with the Lipa citrus experiment station in the testing of about 8 fungicides for control of citrus diseases, scab, canker and powdery mildew, with very good results on scab so far, particularly with ziram.

Soil fumigation works well in vegetable, forest tree, and tobacco seedbeds, but so far we have not found large scale field use for fumigants (Figure 1). Even the Del Monte pineapple farms of 14,000 acres have not yet found enough nematodes in 16 years of operation to make fumigation at all necessary. Tobacco growers, who commonly rotate with rice, also seem to keep reasonably free. The college has a project comparing 7 fungicides on the control of Cercospora leaf spot of tobacco in the seedbed by spraying and another on fumigation of tobacco seedbed soils for nematodes. Zerlate is controlling leaf spot well.

After the war, a white potato growing business was begun on the island of Mindanao but was almost snuffed out by diseases and poor seed-growing methods. Recent purchase and use of 50 sprayers in that area has shown they can control late blight and aphids and get profitable yields. yields.

There is an awakening occurring everywhere on the use of chemicals in agriculture and this interest should mount at an accelerated pace, *for there is no question that the market price for many crops warrants spending the necessary money for pest protection.* There is great need for more compact, light weight, power-driven, inexpensive spraying equipment such

(*Continued on Page* 121)

*Professors of Soils and Plant Pathology respectively Cornell U., former member and contract member of the Cornell-U.P. College of Agriculture contract group. The authors wish to emphasize that the work reported herein is being done primarily by local Filipino staff members in cooperation with the Cornell professors. Dr. N. L. Galves of the Soils department and Drs. F. Orillo and G. O. Ocfemia of the Plant Pathology staff are helping to direct this work.

# COTTON INSECTICIDES

**a review of the past history, present use and future outlook for these important agricultural chemical tools, with particular attention to the chlorinated hydrocarbons. This general review of the subject, with its precautions as to mixing and application of cotton poisons, will be of particular interest to the pesticide dealer and the custom applicator.**

*By H. L. Haller*
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INSECTS that attack cotton have been studied for many years. Early research was directed largely at determining the life history and habits of destructive insects, and cultural methods of control. These investigations provided much background for later control efforts.

The cotton leafworm was the first insect of major importance in cotton growing. Records dating from the eighteenth century show that in some years the cotton leafworm destroyed a fourth of the crop, and on occasion up to 90 percent of the cotton.

Research on the chemical control of cotton insects began in earnest in the early 1900's. It led first to the development of inorganic dusts, and in the last dozen years to use of organic compounds, chiefly from among the chlorinated hydrocarbons, as insecticides. These have been followed by the newer organic phosphorus compounds.

Looking back, we find that paris green was being recommended as a spray as early as 1905. London purple and arsenate of lead also came into general use about that time. Methods of application were crude; which probably accounted for much of the failure to get effective control.

In 1908 arsenate of lead was used in dust form against cotton insects. From that time until 1916, many experiments were conducted with dusts of lead arsenate, paris green and London purple. Against the cottonleaf worm and certain other insects, the dusts were highly effective, but they were not satisfactory against the bollworm or the boll weevil.

The discovery in 1916 that calcium arsenate dust is highly effective against the cotton leafworm and the boll weevil, therefore, was of great importance. Largely because it was an inexpensive chemical and the raw materials for its production were readily available, research to control cotton insects for the next three decades was devoted mostly to developing dusts and dust mixtures of calcium arsenate, as well as methods and the equipment to apply them.

Calcium arsenate has its limitations, of course. When used alone, it often causes an increase in aphid population. A combination of calcium arsenate and nicotine which controls aphids, was found to be effective against the boll weevil—bollworm—cotton aphid complex. Thus research was revealing some of the complexity of the cotton insect problems, but it also demonstrated economical ways of controlling them and helped make cotton growing more profitable. Although calcium arsenate has been largely displaced by organic insecticides, especially the chlorinated hydrocarbons, it is still a useful cotton insecticide.

For many years it was believed that organic compounds could not compete economically with the inorganic insecticides, especially calcium arsenate. However, the discovery of DDT as an insecticide revolutionized the whole field of chemical insect control. DDT was soon followed by other chlorinated hydrocarbons—benzene hexachloride (BHC), toxaphene, chlordane, aldrin, dieldrin, heptachlor, and endrin. Tests soon showed them to be effective, but selective, against insect pests of cotton.

As their name implies, the chlorinated hydrocarbons are organic compounds made up of carbon, hydrogen, and chlorine. Theoretically it is possible to combine these three elements in almost an infinite number of ways, and thousands of chlorinated hydrocarbons have been prepared. Carbon tetrachloride, methyl bromide, paradichlorobenzene are also examples of this class of compounds. Although these three chemicals are useful in insect control, primarily as fumigants, the number of chlorinated hydrocarbons valuable as insecticides is relatively small.

For practical use, the chlorinated hydrocarbon insecticides must be mixed properly with diluents and carriers before they can be applied. Probably no subject is more fundamental than proper mixing or formulation of insecticides. Vital as correct dosage and timing are to effective pest control, it is hardly less important that the insecticide user be furnished with the most efficient formulations which can be devised for any particular application. Unfortunately no one specific method can be outlined to cover the various types of diluents

*Talk by Dr. H. L. Haller, before the Agricultural Chemical Conference at Lubbock, Texas, February 3, 1955. The story of this meeting appears elsewhere in this issue.

# endrin cuts out Mr. Hornworm's quota

A SINGLE HORNWORM can eat a pound of tobacco per season. A heavy infestation can tear the heart out of a tobacco crop. But, the free-eating days of this pest are at an end. Shell's new powerful insecticide *endrin* knocks 'em out and keeps 'em out.

Endrin is easy to use! When Mr. Hornworm infests, simply dust or spray 3-6 ounces of actual endrin per acre. The kill is fast—hornworms that touch, taste or smell endrin are finished for good. And endrin gets the other leaf-eating pests too, such as grasshoppers, flea beetles and budworms.

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and carriers for the many different insecticides. Suffice it to say that designing pesticide formulations is an exercise in the art of compromise as well as in science.

To use the chlorinated hydrocarbon insecticides in pure or undiluted form would obviously be too costly, moreover their physical properties—usually they are coarse or sticky solids or viscous liquids—make them unsuitable for direct application. They may be applied as dusts or as sprays—the latter method of application not being practical with the inorganic insecticides.

Dusts usually are made with tales, clays and diatomaceous earth. Sometimes finely ground plant material, such as tobacco dust or walnut-shell flour, is used. Diluents of dusts are classed according to whether they have low or high bulk density. By this is meant the weight of the dust occupying a definite volume. The low bulk density, or light weight type is illustrated by silica gel, hydrated alumina, calcium silicate, fullers earth and diatomaceous earth. Examples of the high bulk density, or heavy weight type are pyroph·llite, talc, calcite, and certain clays. Mixtures of both types often are used to prepare products that have practical bulk-density values and will also resist caking on storage at high temperatures. The use of the heavy diluents alone may give products that become packed or lumpy on storage.

Dusts also may be prepared by mixing a solution of the insecticidal chemical in a volatile organic solvent, such as acetone or benzene, with the dust diluent; the solvent is then allowed to evaporate, and the mixture is ground. Or a solution of the insecticide may be sprayed into the dust diluent during the mixing and grinding process. Sometimes the chemical is dissolved in a nonvolatile solvent and mixed with the diluent. When this is done, care must be taken so that the amount of the solvent used is not so great as to impair the dusting qualities of the finished dust. Field-strength dusts are sometimes made by diluting or "cutting down" dust concentrates containing 10 to 50 percent of the insecticidal chemical.

Experience over many years with calcium arsenate and paris green had shown that to obtain maximum insecticidal efficiency, a product with good dusting properties is needed. Similarly it has been found that chlorinated hydrocarbon dusts should possess good dusting properties to obtain maximum insecticidal efficiency. Unfortunately, there is no specific test for dustability of an insecticide. Determinations which are useful and frequently used are particle size determination, wet screen analysis, bulk density, and moisture content.

Most of the chlorinated hydrocarbons are stable in the technical or undiluted form, but when mixed with many of the common dust carriers they undergo decomposition or rearrangement, with loss of insecticidal properties. Endrin is especially susceptible to such breakdown, but aldrin, dieldrin, toxaphene, and chlordane behave similarly. The reaction is caused by the catalytic action of acidic centers on the surface of certain diluents or carriers. It is therefore necessary in the preparation of chlorinated hydrocarbon dusts to use diluents that are inherently free of catalytic activity (e.g. alkaline carriers such as lime) or to neutralize completely the acidic sites on the active carriers. Urea and hexamethylene tetramine have been found satisfactory for the deactivation of catalytically active carriers.

For use in spray form the chlorinated hydrocarbon insecticides are formulated as wettable powders or emulsion concentrates. This is necessary because they are insoluble in water. Either preparation on addition to water forms an emulsion or suspension suitable for spraying. In general wettable powders are not used on cotton.

Wettable powders are made by adding wetting agents to dusts. With some kaolin types of clay as the diluent, the addition of a wetting agent is unnecessary. The wetting agent may be adversely affected by the type of diluent, or if the water is extremely hard or highly alkaline. The amount of wetting agent must be carefully adjusted to avoid excessive run-off when the spray is applied to plants.

Emulsion concentrates are made by dissolving the insecticidal chemical and an emulsifying agent in an organic solvent. Usually a solvent substantially insoluble in water is selected, as water-miscible solvents have not in general proved satisfactory.

Two general types of solvents have been used: (1) Solvents, such as toluene or xylene, which evaporate after spraying, to leave a deposit of the insecticide; and (2) nonvolatile solvents, such as alkylated naphthalenes or a petroleum oil, which leave the treated surface coated with a solution of the insecticide in oil after the water has evaporated. Solvents such as toluene and xylene under certain conditions may constitute a fire hazard.

Of course, none of the chlorinated hydrocarbons is a cure all. Not one will control all the insects damaging to cotton. Therefore, they are

(*Turn to Page 125*)

*H. L. Haller*

# Results of 1954

# FUNGICIDE TESTS

THE American Phytopathological Society Special Committee on Testing and Results of Newer Fungicides* has collected data on 1954 fungicide tests from plant pathologists in 24 states, Alaska, 4 provinces of Canada, Ecuador and England. For the second year these data are presented. Acknowledgement is made to the staff of *Agricultural Chemicals* magazine, the National Agricultural Chemicals Association, and to those chemical companies who have contributed to the fund established with the American Phytopathological Society for the purpose of publishing these data.

## Cooperators and Location of Experiments

**Alabama**
1. Diener, U. L., and C. C. Carleton

**California**
2. English, H., E. E. Wilson, J. M. Ogawa
3. Harvey, J. M.
4. Leach, L. D., R. C. Lambe, and W. Seyman
5. _____, _____, and R. H. Garber
6. Middleton, J. T., G. B. Kendrick, Jr., and T. B. Williamson
7. Ogawa, J. M., R. Sanborn, H. English, E. E. Wilson

**Delaware**
8. Heuberger, J. W., and R. R. Romanko

**Florida**
9. Conover, R. A.
10. Kincaid, R. R.

**Georgia**
11. Savage, E. F., B. O. Fry, and C. M. Beckham
11a. Robinson, B. P., and H. D. Wells

**Illinois**
12. Forsberg, J. L.
13. Linn, M. B., and P. J. Sasaki

**Iowa**
14. Reddy, C. S.

**Louisiana**
15. Horn, N. L.

**Maine**
16. Hilborn, M. T.

**Maryland**
17. Smith, W.
18. Weber, P. V. V.
18a. Beecher, F. S.

**Michigan**
19. Anderson, R. L., and D. J. DeZeeuw
19a. Andrews, E.
20. Fulton, R. H.
20a. _____, and R. Wadsworth
20b. _____, and H. Thornton

**Minnesota**
21. Rose, R. C.

**New Jersey**
22. Davis, S. H.
22a. _____, and R. E. Engel

**New York**
22b. Barkè, H. E.
23. Cetas, R. C.
24. Dickey, R. S.
25. Fowler, D. L., and L. M. Massey
26. Lewis, G. D.
27. McFadden, L. A., and A. W. Dimock
28. Mills, W. D.
29. Mills, W. D., and K. G. Parker
29a. Rogers, M. N., and A. W. Dimock
29b. Ross, J. P., and A. W. Dimock
30. Sherf, A. F., and C. Chupp
31. Wilkinson, R. E.

**Ohio**
32. Wilson, J. D.
33. Winter, H. F.

**Oklahoma**
34. Struble, F. B., and L. S. Morrison

**Oregon**
35. Miller, P. W.

**Pennsylvania**
36. Kirby, R. S.

**Rhode Island**
36a. Shurtleff, M. C., and F. L. Howard

**South Carolina**
37. Arndt, C. H.
38. Epps, W. M.
39. Foster, H. H.
40. Riley, J. A.
41. Graham, T. W.
42. Holdeman, Q. L.

**Tennessee**
43. Andes, J. D., and W. M. Epps

**Texas**
44. Lyle, E. W.

**Virginia**
45. Nugent, T. J.
45a. Groves, A. B.

**Washington**
46. Gould, C. J.
47. Johnson, F.
47a. Meiners, J. P.
48. Sprague, R.

**Alaska**
49. Logsdon, C. E.

**Canada**
British Columbia
50. McIntosh, D. L., and J. E. Swales
Nova Scotia
51. Hockey, J. F., and R. G. Ross
Ontario
52. Wallen, V. R.

**Ecuador**
53. Desrosiers, R.

**England**
54. Smith, J. D.

**Annual summary of reports on fungicide tests by 75 collaborating pathologists who cooperate by mailing reports of their work and their findings to a committee of the American Phytopathological Society. This special Committee on Testing and Results of Newer Fungicides, of which Dr. L. G. Utter, Diamond Alkali Co., Painesville, Ohio is chairman, will, as in previous years, reprint the entire report after publication is completed (which will be in June). Reprints may be ordered at $1.00 per copy, through Dr. D. A. Roberts, Dept. Plant Pathology, College of Agriculture, Ithaca, N. Y. Test results were assembled and summarized by Dr. D. A. Roberts of the New York State Agr. Experiment Station, at Cornell University, Ithaca, N. Y.**

*J. W. Heuberger, P. R. Miller, R. H. Wellman, D. A. Roberts, and L. G. Utter, chairman.

## Manufacturers of Materials Tested

(Aa) Buffalo Electro Chemical Co., Buffalo, N. Y.
(A) California Spray Chemical Co., Richmond, Calif.
(AA) Bugges Insecticides, England
(B) Carbide & Carbon Chemicals Co., New York
(BB) W. A. Cleary Corp., New Brunswick, N. J.
(C) Dow Chemical Co., Midland, Mich.
(D) Du Pont de Nemours & Co., E. I., Wilmington, Del.
(DD) Ethyl Corp., New York, N. Y.
(E) Gallowhur Chemical Co., New York
(F) Goodrich Chemical Co., Cleveland
(FF) O. E. Linck Co., Clifton, N. J.
(G) Mallinckrodt Chemical Corp., St. Louis, Mo.
(H) Mathieson Chemical Corp., Baltimore
(HH) May & Baker Co., Ltd., England
(I) Merck & Co., Rahway, N. J.
(J) Metal Salts Chemical Co., Hawthorne, N. J.
(K) Niagara Chemical Div., Food Machinery & Chemical Corp., Middleport, N. Y.
(L) Onyx Oil Chemical Co., Jersey City, N. J.
(M) Panogen, Inc., New York
(N) Pfizer & Co., Chas., Brooklyn, N. Y.
(P) Pittsburgh Plate Glass Co., Pittsburgh, Pa.
(PP) Plant Protection Ltd., England
(Q) Purex Corp., Ltd., Southgate, Calif.
(R) Rohm & Haas Co., Philadelphia
(S) Shell Chemical Corp., Denver, Colo.
(T) Stauffer Chemical Co., New York
(U) Sterwin Chemicals Co., New York
(UU) Tennessee Corp., Atlanta, Ga.
(V) U. S. Rubber Co., New York
(VV) The Upjohn Co., Kalamazoo, Mich.
(W) Velsicol Corp., Chicago
(WW) Vineland Chemical Co.
(X) Not Named by Cooperator
(Y) From Europe; manufacturer not known

## Fruit and Nut Crops

### Apples

SULFUR sprays, captan, glyodin, Phygon-XL, and ferbam were used successfully in spray programs against apple scab and cedar-apple rusts (8, 28, 43, 50).* Results of some tests in which the effectiveness of most of these materials was compared with that of other fungicides are presented in Tables 1-5. Powdery mildew was effectively controlled by sulfur (28) and by Karathane (8, Table 6), although care must be exercised to avoid russetting of fruit when sulfur materials are used. On the basis of results in 1954, 2-4-100 Bordeaux Mixture or captan in four bimonthly applications beginning at petal fall, are recommended for blotch control in Oklahoma (34). Summer sprays consisting of ferbam (28) or of captan and zineb (Table 5) effectively controlled apple blotch in New York and Delaware.

Streptomycin at 100 ppm in two applications effectively controlled fire blight in Tennessee (43) and in New York and Virgina (28, 45a) but resulted in intervenial chlorosis, particularly on leaves of the Rhode Island Greening variety.

*Numbers in parentheses refer to list of co-operators.

## Fungicides, Bactericides, and Nematocides Tested for Control of Diseases of Fruit and Nut Crops*

| | |
|---|---|
| Agri-mycin (A) | streptomycin and terramycin |
| Bordeaux mixture | reaction product of copper sulfate and calcium hydroxide |
| —— | calcium cyanamid |
| Calogreen (G) | mercurous chloride |
| captan | *N*-(trichloromethylthio)-4-cyclohexene-1,2-dicarboximide |
| Captan 50-W (T) | see captan |
| COCS (K) | basic copper chloride; basic copper sulfate |
| Copper A Compound (D) | basic copper chloride |
| Coromerc (P) | *N*-phenylmercuriethylenediamine |
| Corosul D (X) | sulfur |
| Crag Fruit Fungicide 341 (B) | see glyodin |
| Crag 5400 (B) | trithiobis (*N*-dimethylthioformamide) |
| dichlone | 2,3-dichloro-1,4-naphthoquinone |
| Dithane Z-78 (R) | see nabam |
| Dithane M-22 (R) | see maneb |
| Dithane X-78 (R) | see zineb |
| DN-111 (C) | dicyclohexylamine salt of 2-cyclohexyl-4,6-dinitrophenol |
| DN-289 (C) | triethanolamine salt of 2-sec-butyl-4,6-dinitrophenol |
| Dowicide A (C) | sodium *o*-phenylphenate |
| Erad (X) | —— |
| ferbam | ferric dimethyldithiocarbamate |
| Fermate (D) | see ferbam |
| Flotox wettable sulfur (A) | sulfur |
| Fusarex (U) | tetrachloronitrobenzene |
| glyodin | 2-heptadecyl-imidazoline acetate |
| Good-rite SDD (F) | sodium dimethyldithiocarbamate |
| Isothan Q15 (L) | 2-dodecylisoquinolinium bromide |
| Karathane (R) | 2-(1-methylheptyl)-4,6-dinitrophenyl crotonate |
| Kolofog (K) | sulfur |
| Kolospray (K) | sulfur |
| lime sulfur (A and X) | calcium polysulfides |
| Magnetic 70 (T) | sulfur |
| maneb | manganous ethylenebis[dithiocarbamate] |
| Manzate (D) | see maneb |
| Mathieson Bulb Fungicide 275 (H) | pentachloronitrobenzene |
| Nabam | disodium ethylenebis[dithiocarbamate] |
| Nirit (Y) | see captan |
| Orthocide 406; 50 Wettable (A) | 1-thiocyano-2,4-dinitrobenzene |
| Panogen (M) | cyano(methylmercuri)guanidine |
| Phix (X) | —— |
| Phygon XL (V) | see dichlone |
| Polysulfide compound (K) | polysulfides |
| Puratized Apple Spray (E) | (2-hydroxyethyl)(phenylmercuri) ammonium acetate |
| Purex (Q) | sodium hypochlorite |
| —— | sodium cyanamid |
| Streptomycin sulfate (I) | streptomycin |
| Streptomycin nitrate (H) | streptomycin |
| Sulforon (D) | sulfur |
| Tag 331 (A) | phenylmercury acetate |
| —— | tetrachloroethylene |
| Vancide 51 (K) | sodium dimethyldithiocarbamate; sodium 2-mercaptobenzothiazole |
| Vancide 51ZW (K) | zinc dimethyldithiocarbamate; zinc 2-mercaptobenzothiazole |
| Yellow cuprocide (R) | cuprous oxide |
| Zerlate (D) | see ziram |
| Zineb | zinc ethylenebis[dithiocarbamate] |
| ziram | zinc dimethyldithiocarbamate |
| Formulation 48-CS-36 (W) | —— |
| AL 126 (S) | —— |

*Letters in parentheses refer to list of manufacturers of materials.
**Most names taken from: McCallan, S.E.A., L. B. Miller, and Mary A. Magill. 1955. Chemical names for active ingredients of fungicides. *Phytopathology* 45: (In press).

| Material | Chemical Name of Active Ingredient** |
|---|---|
| C. and C. EF 224 (B) | mercury zinc chromate |
| OS 377 (S) | —— |
| Mathieson 466 (H) | copper dihydrazinium sulfate |
| N-521 (T) | 3,5-dimethyltetrahydro-1,3,5,2*H*-thiadiazine-2-thione |
| LO 737 (R) | —— |
| LO 738 (R) | ethylenebis(thiuram tetrasulfide) |
| BTC 824 (L) | —— |
| Formulation 4153 (J) | —— |
| C. and C. EF 6428 (B) | —— |
| C. and C. EF 6970 (B) | —— |

**TABLE 1**

**Spray materials tested for apple scab control in Ohio (33) listed in decreasing order of disease control.**

| Infection periods | Materials tested conc./ 100 gal. | Protective covers | conc./ 100 gal. | Varieties in Tests[a] |
|---|---|---|---|---|
| Puratized Apple Spray[b] | ½ pt. | Captan | 1 lb. | R |
| Phix[b] | 4 oz. | Captan | 1 lb. | M, C |
| PAS | ¼ pt. | Glyodin | 1½ pt. | R |
| Phix | 2 oz. | Glyodin | 1½ pt. | R |
| Coromerc[b] | ½ lb. | Captan | 1 lb. | M, R |
| Microfine Wettable Sulfur | 6 lb. | Sulfur | 5 lb. | M, C |
| Coromerc | ¼ lb. | Ferbam | ¾ lb. | R |
| Coromerc | ¼ lb. | Captan | 1 lb. | R |
| Coromerc | ¼ lb. | Glyodin | 1½ pt. | R |
| Glyodin | 2 pt. | Glyodin | 1 pt. | R |
| Captan | 2 lb. | Captan | 1 lb. | R |

[a] M = McIntosh; C = Cortland; R = Red Rome
[b] After rains only. This resulted in one less prebloom application than did other treatments.

**TABLE 4**

**Materials tested for apple scab and cedar-apple rust control in Tennessee (43).**

| Material | conc./100 gal. | Experimenters' Preference Scab | Rust |
|---|---|---|---|
| TAG plus glyodin; glyodin as cover | 1 pt. and ½ pt. | 2 | 3 |
| Captan | 2 lb. | 1 | 2 |
| Vancide | 2 lb. | 3 | 1 |
| Ferbam plus wettable sulfur | ½ lb. (76%) 6 lb. | 4 | 1 |
| Panogen | ¼ pt. | 5[a] | 4[a] |

[a] Phytotoxic. Disease control not satisfactory.

**TABLE 5**

**Materials tested on Rome apples in Delaware (8) for control of scab, sooty blotch, and "Botryosphaeria ribis" disease.**

| | Material | Conc./ 100 gal. | Schedule | Disease incidence (%) at harvest time Scab | Blotch | B. ribis |
|---|---|---|---|---|---|---|
| 1. | None | | — | 50 | 27 | 37 |
| 2. | Tag | ½ pt. | Pre-pink | | | |
| | Captan plus Zineb | 1 lb. and 1 lb. | Pink | | | |
| | Zineb | 2 lb. | Full Bloom | | | |
| | Captan plus Zineb | 1 lb. and 1 lb. | Petal Fall-1 cover | | | |
| | Captan | 1½ lb. | 2-3 cover | | | |
| | Captan plus Zineb | ¾ lb. and ¾ lb. | 4-8 cover | 1 | 6 | 10 |
| 3. | Same as 2 except: Tag plus captan | ¼ lb. and 1 lb. | Pink-1 cover | 1 | 8 | 6 |
| 4. | Same as 3 except: Captan plus Zineb | 1 lb. and 1 lb. | Pink-1 cover | | | |
| | Zineb | 1½ lb. | 4-8 cover | 1 | 6 | 10 |

**TABLE 2**

**Spray materials tested for apple scab control in Maine (16) listed in decreasing order of overall preference.**

| Materials[a] | conc./100 gal. | Order of Disease Control |
|---|---|---|
| Crag 341 plus Puratized Apple Spray | ¾ qt. plus ½ pt. | 3 |
| Glyodin | 1½ qt. | 2 |
| Captan | 2 lb. | 6 |
| Dichlone[b] (Glyodin 5 cover sprays) | ⅜ qt. (1 qt.) | 5 |
| Sulfur | 6 lb. | 7 |
| LO-341 | 1½ qt. | 4 |
| T-341 | 1½ qt. | 1 |

[a] Any except last two materials recommended for grower use in 1955.
[b] Some phytotoxicity.

**TABLE 3**

**Materials tested in 9 successive applications, May 1-July 23, 1954, for apple scab and cedar-apple rust control in Nova Scotia (51).**

| Material | conc./ 100 gal. | Order of yield | Preference | Recommended for control of |
|---|---|---|---|---|
| Captan | 2 lb. | 1 | 1 | Scab |
| Crag Fruit Fungicide | 1½ qt. | 2 | 2 | Scab |
| Fermate | 2 lb. | 4 | 3 | Rust |
| Mag. 70 paste | 9 lb. | 3 | 4 | —— |

**TABLE 6**

**Materials tested for control of powdery mildew of apple in Washington (48).**

| Material[a] | conc./ 100 gal. | Disease Control[b] | Recommended |
|---|---|---|---|
| Karathane | 1 lb. | S | Yes |
| Liquid Lime-sulfur | 2½% | S | Yes[c] |
| Orthocide | 2 qt. | S | Yes |
| Polysulfide compound | 4 lb. | U | No |
| No. 466 (Mathieson)[d] | ¾ lb. | U | No |
| DN 111[d] | 2 lb. | U | No |
| DN 289[d] | 1 pt. | U | No |
| Wettable sulfur | 3 lb. | S | Yes[e] |

[a] Applications = pre-pink, pink, calyx, cover (14 da.), and, in part 2nd cover (14 da. later).
[b] S = satisfactory; U = unsatisfactory.
[c] Use on Rome, Jonathan, and other sulfur-tolerant varieties; change to Karathane for cover sprays.
[d] Performance does not warrant further trial.
[e] Risk of sulfur shock at cover sprays.

**Pears**

RESULTS of fungicide tests to control diseases were not reported sufficient numbers to warrant making generalizations. Performance of materials tested in Washington (48) for fireblight control is presented in Table 7.

| | | | | | |
|---|---|---|---|---|---|
| 5. Same as 2 except: | | | | | |
| Captan | 2 lb. | Pre-pink | | | |
| Zineb | 1½ lb. | 4-8 cover | 2 | 14 | 7 |
| 6. Same as 5 except: | | | | | |
| Captan | 1½ lb. | 2-8 cover | 1 | 25 | 6 |
| 7. Same as 5 except: | | | | | |
| Mag. 70 plus Captan | 4 lb. and 1 lb. | Pre-pink | | | |
| Mag. 70 plus Zineb | 4 lb. and 1 lb. | Pink | 1 | 14 | 10 |
| LSD where P = 0.01 | | | — | 9 | 7 |

**TABLE 7**
**Materials tested for control of fireblight of pears.**

| Material | Concentration | Recommended for grower use |
|---|---|---|
| Agri-mycin | 120 ppm | Yes[a] |
| Streptomycin Sulfate | 120 ppm | Yes[a] |
| Bordeaux Mixture | ½-½-100 | Yes[b] |
| COCS | ½ lb./100 gal. | Yes[b] |
| Zineb | 1½ lb./100 gal. | No[c] |

[a] Too expensive for most growers.
[b] Some russetting of fruit, especially of the variety Anjou.
[c] Does not warrant further trial.

**TABLE 8**
**Fungicides tested for control of brown rot of peaches in California (7). Applications made 3 or 4 weeks before harvest, and 1 week before harvest.**

| Material | conc./ 100 gal. | Order of Disease Control | Experimeters' Preference |
|---|---|---|---|
| Captan | 2 lb. | 1 | 2 |
| Zineb | 2 lb. | 1 | 2 |
| Maneb | 2 lb. | 1 | 2 |
| Wettable sulfur | 10 lb. | 1 | 1 |
| Phygon XL | ¾ lb. | 1 | —[a] |
| Phygon XL | ½ lb. | 1 | —[a] |
| Vancide 51 ZW | 2 lb. | 2 | 3 |
| Math. Bulb Fung. 275 | 6 lb. | 2 | 3 |
| Purex | 1 gal. | 2 | 3 |

[a] Phytotoxic.

**TABLE 9**
**Fungicides applied to peaches after infections by the brown rot figure (7).**

| Material | conc./ 100 gal. | Order of Disease control |
|---|---|---|
| Lime sulfur[a] | 2 gal. | 1 |
| Lime sulfur | ½ gal. | 2 |
| Polysulfide compound | 2.4 lb. | 1 |
| Purex | 4 gal. | 2 |
| Manzate[b] | 4 lb. | 2 |
| Dowicide A[c] | 4 pt. | 2 |
| Captan[c] | 4 lb. | 2 |
| Isothan Q 15[c] | 2 pt. | 2 |

[a] Very slight injury to fruits in one plot.
[b] Moderate fruit injury.
[c] Slight fruit injury.

### Peaches

PEACH scab was controlled effectively by wettable sulfur and by captan in South Carolina (39, 40), and Tennessee (43), and is readily controlled by customary sprays or dusts of sulfur, ziram, or captan in New York (28). Maneb at 2 lb./100 gal. provided phytotoxic to peach fruits (7, 39). Fungicides which did not control peach scab in 1954 were glyodin (1qt./100 gal.), glyodin (1 qt./100 gal.) plus Phygon (½ lb.), and Vancide M (2 lb./100 gal.) (43, 11).

Both captan and wettable sulfur gave satisfactory control of brown rot in South Carolina, but, of these 2 materials, only captan controlled Rhizopus storage rot (39). Six and 8 applications of captan (2 lb./100 gal.) and of sulfur (6 lb./100 gal.) were made on 3 varieties of peach. Further, some plots received 2X concentrate sprays of the same chemicals, and spray materials were delivered either from both sides of the blower or from one side of the blower. Differences resulting from varieties, spray concentrations, and method of application were small. Results of additional field plot tests for brown rot and Rhizopus rot control are presented in Tables 8-10, and materials which show promise in post-harvest applications for control of the same two diseases appear in Table 11.

A fall or spring application of one of the following is recommended for control of peach leaf curl in New York (28): ferbam (1½ lb./100 gal.), lime sulfur (6½ gal.), dinitro compound materials (½ gal. or 2 lb. of dry wettable), bordeaux mixture (10-10-100). Results of a test to control peach leaf curl in California are presented in Table 12.

**TABLE 10**
**Materials tested for control of brown rot and Rhizopus rot of peaches in Georgia (11) are listed in order of experimenter's preference.[a]**

| Material | Concentration/100 gal. |
|---|---|
| Captan[b] | 2 lb. |
| Manzate | 2 lb. |
| Vancide 51 (Mn Salt) | 2 lb. |
| Glyodin | 1 qt. |

[a] Three cover applications and 3 pre-harvest applications.
[b] Recommend for grower use.

**TABLE 12**
**Performance of materials applied to peach trees on Dec. 1, 1954 for leaf curl control (2).**

| Material | conc./ 100 gal. | Order of Disease control |
|---|---|---|
| Zerlate[a] | 3 lb. | 1 |
| Phygon XL | 1½ lb. | 2 |
| Dithane D 14[b] | 1gal. | 2 |
| Tribasic copper sulfate | 5 lb. | 3 |
| Captan | 1½ lb.[c] | 3 |

[a] Plus 3 pints ES-55 aprender.
[b] Plus iron and zinc sulfates, and plus 1 gal. "Moyer Dormant Soluble."
[c] 90 per cent active ingredient.

### Cacao

IN an exploratory field trial, 6 fungicides were tested as protectants against Monilia pod rot of cacao in a spray schedule involving applications at 7 to 10 day intervals throughout the year (53). Chemicals tested are listed in decreasing order of disease control: yellow cuprocide at 1 lb./100 gal., wettable sulfur at 10 lb., zineb at 2 lb., ferbam at 2 lb., ziram at 2 lb., and COCS at 1½ lb. All chemicals gave good control, but that obtained with the first 3 materials listed was significantly better than that obtained with the others. Trees in sulfur-sprayed plots yielded at a rate of 2.9 times that of 1953, while those in all other plots except those sprayed with yellow cuprocide yielded 1.9 times as much as they had in 1953. Although yellow cuprocide controlled pod rot, its use failed to result in increased yields, possibly because of phytotoxicity. Some leaf scorch and crinkling occurred in zineb-sprayed plots.

**TABLE 11**
**Fungicides effective in the control of brown rot in storage and Rhizopus fruit rot of peaches in Maryland (17).[a]**

| Material | Concentration[b] | Experimenters' preference (1 = best) |
|---|---|---|
| Dowicide A | 0.5% | 1 |
| Captan | 1.0% | 2 |
| Isothan Q 15 | 0.5% | 3 |
| Tetrachloroethylene[c] | 1 part/20,000 parts air | 4 |
| Shell AL 126 | 0.126% | 5 |
| Sulfur dust plus tetrachloroethylene[c] | 94% plus 1 part/20,000 parts air | 1 |

[a] Fungicides listed are best of approx. 150 tested.
[b] Either fruit were completely covered by materials or were fumigated for 24 hr. in sealed tanks.
[c] Extraordinary precautions required to safeguard operators.

### Persian Walnuts

WALNUT bacteriosis in Oregon was effectively controlled by early pre-bloom, late pre-bloom, and early post-bloom applications of yellow cuprocide at 2 lb./100, agrimycin (100 ppm streptomycin and 10 ppm terramycin), or by Copper A compound at 2 lb./100 (35). Agrimycin was the least phytotoxic of the 3 materials, and gave better control than did Copper A compound. Yellow cuprocide gave best control, but was more phytotoxic than either of the other 2 materials. Both yellow cuprocide and Copper A compound are recommended for grower use. Agrimycin, which was tested in 1954 for the first time in these plots, is considered too costly to be recommended for grower use in 1955.

### Almonds

FOUR applications of captan, or ziram, or maneb satisfactorily controlled Coryneum blight of almond in California (2). Applications were made at the "popcorn" stage, one week later, 5 weeks after petal fall, and 1 month after shuck fall. Results of a 1954 spray trial are presented in Table 13.

**TABLE 13**

**Performance of materials tested for control of Coryneum blight of almond (2).[a]**

| Material | conc./ 100 gal. | Order of Disease Control | Recommended for grower use |
|---|---|---|---|
| Orthocide 50 W | 2 lb. | 1 | Yes |
| Zerlate | 2 lb. | 1 | Yes |
| Manzate[b] | 2 lb. | 1 | Yes |
| Phygon XL | 2 lb. | 2 | No |
| Karathane WD | ¾ lb. | 3 | No |
| Flotox wettable S | 6 lb. | 3 | No |
| Kolospray and Kolofog[b] | 6 lb. | 3 | No |
| Bordeaux mixture[c] | 50-50-50<br>25-25-50<br>20-20-50 | — | No |

[a] Applications at "popcorn" stage, 1 wk. later, 5 wk. after petal fall, 1 mo. after shuck fall.
[b] "Popcorn" spray consisted of Zerlate at 2 lb./100 gal.
[c] Phytotoxic.

### Red Raspberries

ANTHRACNOSE of red raspberries in Western Washington was controlled by sprays applied on June 11 or 12 and on June 24 (47). The 4 materials which are recommended for grower use are listed in decreasing order of disease control: Phygon XL (0.5 lb./100 gal.), Orthocide (2 lb.), Dithane M 22 (1.5 lb.) and Fermate (1.5 lb.). Crag 341 (1 qt.), L.O. 738 (2 lb.), and Dithane Z-78 (1.5 lb.) did not give satisfactory control, and further testing of these 3 materials is not warranted.

### Black Raspberries

FERMATE (1.5 lb.) is recommended for anthracnose control in Michigan (20). Neither Dithane Z-78 nor Crag 341 gave satisfactory control (Table 14).

**TABLE 14**

**Materials tested for control of black raspberry anthracnose are listed in decreasing order of disease control (20).**

| Material[a] | conc./100 gal. | Recommended for grower use |
|---|---|---|
| Coro-SDD and iron sulfate | 1.5 pints and 1 lb. | Not yet |
| Fermate | 1.5 lb. | Yes |
| Coro-SDD and zinc sulfate | 1 qt. and 1 lb. | Not yet |
| Dithane Z-78[b] | 1.5 lb. | No |
| Crag 341[b] | 1.5 qt.-lime | No |

[a] Protectants listed applied at pre-blossom stage and when fruiting laterals were 5 or 6 inches long. Lime-sulfur (10 gal./100 gal.) was applied earlier to all plots at the time when 1 or 2 leaves had unfolded.
[b] Performance does not warrant further trial.

**TABLE 15**

**Materials tested for grape black rot control are listed in decreasing order of of effectiveness (20b).**

| Material[a] | conc./100 gal. | Recommended for grower use |
|---|---|---|
| Coro-SDD and iron sulfate | 1 qt. and 1 lb. | Not yet |
| Dithane Z-78 | 2 lb. | Yes |
| Coro-SDD and zinc sulfate | 1.5 pints and 1 lb. | Not yet |
| Fermate | 1.5 lb | Yes |
| Crag 341[b] | 1.5 qt.-lime | No |

[a] All materials except Crag 341 contained Rohm and Haas B 1956 adjuvant.
[b] Did not control black rot, but appears to be of value in obtaining high values for soluble solids in fruit.

### Blackberries

DITHANE M-22 (2 lb./100 gal.) captan (2 lb.), and Fermate (1.5 lb.) satisfactorily controlled blackberry leafspot when applied from 3 to 5 times at 7 to 14 day intervals, beginning when first leaves unfolded (1). Best control of disease was obtained, and highest yields occurred in Dithane M-22 sprayed plots, and Fermate proved to be the most economical of the three materials in 1954. Each material is recommended for grower use.

### Blueberries

CALCIUM cyanamide dust (100 lb./A.) and sodium cyanamide spray (18 lb. active/A.) were applied as soil treatments approximately 1 week before apothecia of *Monilina Vaccinii-corymbosi* developed and again at the time that apothecia were observed (20a). Sodium cyanamide did not control mummyberry disease, and will not be used in further trials. Calcium cyanamide controlled the disease but is not yet recommended for grower use. Tests have been on the same plots for three years. There has been no evidence of plant injury, and soil pH values have remained unchanged.

### Grapes

IN Michigan (20b), 5 applications of protectants were made between May 28 and July 27 for the control of black rot of Concord grapes. Materials were applied when shoots were from 4 to 6 in. long, at pre-bloom stage, 10 days later, at post-bloom stage, and at berry touch stage. Comparative results are presented in Table 15.

Plots of Emperor table grapes in California (3) were dusted 4 times at monthly intervals (July-October) with protectants being tested for Botrytis grey mold rot. There was more fruit decay in plots dusted with Fusarex (3%) than in nondusted plots, and B-622 (5%) proved phytotoxic. Best control was obtained with captan (5%), with Crag 5400 (6%) giving second best control. Fusarex and B-622 do not warrant further testing, and Crag 5400 requires extraordinary precautions to safeguard operators.

### Strawberries

STRAWBERRIES were dipped in suspensions of conidia and fungicides being tested for control of Botrytis grey mold rot in storage (15). All materials tested controlled the disease. Results are presented in Table 15.

**TABLE 16**

**Botrytis grey mold occurring on strawberries following a fungicide dip (15).**

| Fungicide | Concentration | Rotted fruit % |
|---|---|---|
| Good-rite SDD | 1-100 | 5 |
| Vancide 51 | 1-50 | 40 |
| C. and C. EF 6970 | 1-50 | 20 |
| C. and C. EF 6428 | 1-50 | 15 |
| BTC 824 | 1-1000 | 30 |
| Formulation 4153 | 1-50 | 55 |
| C. and C. EF 224 | 1-500 | 0 |
| Compound N-521 | 1-500 | 13 |
| Formulation 48-CS-36 | 1-500 | 13 |
| Calogreen | 1-1000 | 7 |
| None; dipped in conidial suspension | —— | 85 |
| None; berries dry | —— | 25 |

*(Part II Next Month)*

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# Fertilizer Use & Crop Yields

IN spite of the continuing upward trend in fertilizer usage in the midwest, and the gradual northward and westward shift in the pattern of fertilizer consumption, the South, long the number one market in the United States for the fertilizer industry, still continues to account for about fifty percent of national consumption. However the North Central States, with their high production of soil-depleting crops, show the greatest possibilities for future increases in fertilizer use. These and a series of other interesting comparisons are revealed in a study just published by the Fertilizer Work Group of the National Soil and Fertilizer Research Committee of the U. S. Department of Agriculture, as U.S.D.A. Handbook #68 under the title, "Fertilizer Use and Crop Yields in the United States."

The report divides the country into four groups of states or regions —Southern, North Central, Northeastern and Western. Tables showing 1950 consumption of nitrogen, phosphate and potash are presented together with estimates of the consumption necessary to bring about maximum production in 1955. Also included in each section is a discussion of the opportunities for more efficient use of fertilizers. The latter part of the book is devoted to crop response tables, arranged by regions and subdivided into the particular states.

The tables and graphs for the South reveal that yields on most crops are only one third to one half the potential, but that average yields of tobacco and a few vegetable crops are now approaching the maximum, at least on the basis of short range estimates. 1950 data indicated that North Carolina, Georgia and Alabama use 40% of the total fertilizer consumed by the Southern states, and 20% of the fertilizer used in the country. Mississippi and Louisiana use lesser amounts, because of the lower per capita income of these regions. Similar low consumption in Texas and Oklahoma is explained by the large amount of semi-arid and arid land in those states.

The best potential for expansion of the fertilizer market in the South lies in pasture lands, the USDA group reports. After pasture lands, the best potentialities for higher yields through fertilizer application are in corn, cotton and wheat. By using an average of only fifteen pounds of nitrogen per acre of cotton, an amount far below the optimum, the Southern farmer has been able to produce only 45 per cent of the potential maximum yield.

It is pointed out that fertilizer applications on some crops could be reduced without appreciably lowering production. Although this situation is not characteristic of many crops in the South, it holds in regard to use of phosphates on fruits, vegetables, potatoes, a few specialty crops, and particularly tobacco. The latter is getting about 90 pounds of $P_2O_5$ per acre, whereas evidence shows that considerably less could be used.

### North Central States

IN the North Central states, full fertilization would increase corn yields from 44 (the 1950 figure) to 67 bushels per acre, a gain of more than one billion bushels per year. The amount of fertilizer necessary to produce such an increase is, of course, very large, but would diminish as the soil began to store some of the nutrients. To quote from the report, "In Wisconsin . . . estimates indicate that the total tonnage required would be

(*Continued on Page 115*)

**Estimates of Quantities of Commercial Plant Nutrients Used**

| State | 1950 (tons) N | $P_2O_5$ | $K_2O$ | TOTAL | 1955 attainable (tons) N | $P_2O_5$ | $K_2O$ | TOTAL |
|---|---|---|---|---|---|---|---|---|
| Southern States | 571,215 | 917,283 | 510,517 | 1,999,015 | 949,095 | 1,344,750 | 869,391 | 3,163,236 |
| North Central States | 174,016 | 747,232 | 383,152 | 1,304,400 | 596,947 | 1,250,552 | 724,341 | 2,571,840 |
| Northeastern States | 94,038 | 294,610 | 167,166 | 555,814 | 140,026 | 416,822 | 297,514 | 854,362 |
| Western States | 186,735 | 129,266 | 21,041 | 337,042 | 290,987 | 208,707 | 24,896 | 524,500 |
| TOTALS | 1,026,004 | 2,088,391 | 1,081,876 | 4,196,271 | 1,976,965 | 3,220,831 | 1,916,142 | 7,113,938 |

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LISTENING *Post*

## Survey Shows Insect Activity On Increase

**This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Economic Insect Survey Section, Plant Pest Control Branch, U. S. Department of Agriculture, Washington. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the United States.**

**By Kelvin Dorward**

AMONG the insects showing early activity, those attacking cereal and forage crops are perhaps the most active. The most prominent among the insects arousing concern in the southwest during early March was the yellow clover aphid which was recently reviewed in this magazine. This aphid, now known to have been in Oklahoma during the fall of 1954, survived the winter in that state in fairly large numbers. The insect was building up on alfalfa in Pinal County, Ariz., where some fields were requiring treatment. Severe infestations were reported from Graham and Greenlee Counties. In Greenlee County the aphids had killed out some untreated young fields of alfalfa. It is also interesting to note that temperatures had been as low as 50° in the county, but the aphids survived. Numbers present in southern Nevada in early March indicated possible economic population on the second cutting of alfalfa. Maverick County, Tex., reported heavy damage to young alfalfa. Although severe cold in the pan-handle of Texas reduced the population of aphids, an increase is expected since alfalfa is beginning to grow.

Surveys for small grain insects in some Texas Panhandle and South Plains Counties during February showed, in general, a low infestation of greenbugs. However, populations per linear foot of row reached 70 in Swisher County, 40 in Deaf Smith, 150 in Randall, 100 in Donley and 50 in Haskell. In Dallas County, spotted infestations were found and in Tarrant it was thought the predators would control the local infestations. Only one colony of greenbugs was found during a 13 county survey in Kansas. This colony was found in Harper County.

A grain mite (*Penthaleus major*) has been causing damage in Tennessee and Texas. Spotted infestations damaged small grains in Knox County, Tennessee, during early March. Heavy infestations were reported from the Texas Counties of McLennan, Coryell, Dallas, Collin, Denton, Falls and Kendall.

The true armyworm, which during the past two seasons caused extensive damage in various areas, is now active. Larvae were collected from wild hosts on February 12 in Washington County, Arkansas, and adults were observed February 9, in Johnson County. Both counties are in the northwestern part of the state. By late February, light infestations of early instars were found at Baton Rouge, Louisiana. Adults were readily taken during January in light traps at St. Joseph, Franklin and Baton Rouge, Louisiana. Collections were also made in February at traps in Weslaco, Texas, and at Homestead, Sanford and Gainesville, Florida. Larvae of the army cutworm averaged about one per 6 to 8 feet of row in wheat and barley in Kansas Counties of McPherson, Harvey and Sedgwick during early March.

The vegetable weevil was one of the most active vegetable insects during late February and early March. This insect caused damage to turnips and spinach in the Charleston area of South Carolina. The weevil was heavily infesting turnips locally in the Gainesville, Florida, area. Garden crops were damaged in Forrest County, Mississippi. Texas and North Carolina also reported local infestations.

Other vegetable insects of importance during February and March included the potato psyllid. In the Tempe, Arizona, area populations of this insect were as great or greater than those of last year. The brown wheat mite damaged about 100 acres of onions in the Robstown, Texas area. The green peach aphid was abundant on lettuce in parts of California and numerous enough locally in North Carolina that it may later be a threat to tobacco and other crops in this latter state.

At least one-half of the spinach crop in the Winter Garden area of Texas was lost to curly top, a virus carried by the beet leafhopper. From a recent survey conducted in the desert breeding area of the beet leafhopper, it is expected that the spring movement to the cultivated districts of north and central Utah and western Colorado would be normal as is the movement to southern Utah, southern Nevada, southeastern California and central Arizona. The local movement in Utah and western Colorado is expected to be light. In New Jersey a survey of 40 asparagus fields in Burlington, Cumberland, Gloucester and Salem counties showed every field to be infested with the asparagus miner. Stalk infestation ranged from 3 to 82 per cent which indicates that the pest may influence

asparagus production during the coming season.

Mites collected from field-grown tomato plants in a greenhouse at Charleston, South Carolina, in November 1954, have been identified as the tomato russet mite, the first record of the mite in South Carolina.

The first survival counts on overwintered boll weevils have been made in South Carolina. Two hundred woods trash samples were collected during the period of February 24 to March 4 on the same farms of Florence County from which samples were collected last fall. Live boll weevils found ranged from zero to 15,488 per acre with an average of 2,178 per acre. This number is slightly more than the 1,936 found in the spring of 1954. The 1954-55 winter survival was 94.7 per cent compared to a 54.7 per cent survival for the winter of 1953-54. In only three other years (1949, 1950 and 1953) of the last 18 has the survival per cent been higher.

Fall hibernation counts have been completed in Arkansas. Ground trash samples were taken in the 10 counties with averages as follows: Hempstead 82, Lafayette 0, Ashley 97, Drew 64, Lincoln 0, Poinsett 0, Jackson 24, Craighead 226, North Logan 230, South Franklin 97. The largest number of weevils per acre on one farm was found in Logan County. The count was 968 live weevils per acre.

Surface debris inspection in Texas to February 15 to determine pink bollworm winter survival showed 5.5 live specimens per 100 bolls as compared with 8.1 as of February 15 last year. Reports emphasize the small amount of debris left in the cultural control areas. Specimens found in the lower Rio Grande Valley counties of Cameron, Hidalgo and Willacy during the period February 1-15 averaged 5.25 live worms per acre. San Patricio and Nueces averaged 9.05 per acre; Bee and Live Oak 15.8 per acre; Brazos and Washington 2,376; Medina 117.6 and Tom Green 64.2. The last four counties mentioned appear to be "hot spots" and do not necessarily indicate the degree of infestation in the general area represented.

## A Comparison of Fungicides for Control of Apple Powdery Mildew

**This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Epidemics and Identification Section, Horticultural Crops Research Branch, U. S. Department of Agriculture, Beltsville, Md.**

**By Paul R. Miller**

DURING the past several years, apple powdery mildew caused by *Podosphaera leucotricha* has been unusually prevalent in certain blocks of Jonathan and Rome Beauty apples in eastern orchards, according to Louis Beraha, Roy A. Wilson and John C. Dunegan of the U. S. Department of Agriculture, Agricultural Research Service.

They state that the control of this disease poses a serious problem. Sulfur preparations, long the standard mildew remedies, are not being used extensively by commercial growers now because of their deleterious effect on apple trees. An effective non-phytotoxic material is therefore urgently needed.

In 1954, seven organic compounds were compared with wettable sulfur for the control of apple powdery mildew, in a block of 11-year-old Rome Beauty trees at Plant Industry Station, Beltsville, Md. Eighty trees showing over-wintering bud infections were arranged in a randomized 10-treatment, 8-replicate design.

The various treatments (Table 1) were applied on April 13 (pre-pink), April 19 (pink), April 30 (calyx), and May 13 (first cover). Parathion (⅓ pound in 100 gallons of water) was used in all the sprays except the pre-pink application. Tween 20 (0.025%) was added to Actidione as a spreader. The check trees were sprayed with water. Both concentrations of Actidione caused serious leaf injury and this treatment was omitted in the fourth (first cover) spray.

Between June 7 and 15, leaves of approximately uniform age (third leaf from the apex) were collected from 50 shoots selected at random from each tree. These leaves were rated in 6 classes on the basis of approximate area of the underside of the leaf covered by the mildew fungus from class 0 (0) to class 5 (100 per cent). A coded infection grade for each treatment was derived from the sum of the class ratings multiplied by the class frequency divided by 8 (the number of replicates in a treatment).

(*Continued on Page* 109)

**TABLE 1.**

**Apple mildew on leaves of Rome Beauty trees sprayed with various materials.**

| Material | Dosage | Coded infection grade | Mean percent of lower leaf area infected |
|---|---|---|---|
| Actidione | 1 p.p.m. | 1920 | 38.4 |
| Actidione | 2 p.p.m. | 2463 | 49.3 |
| Karathane | ¾ lb.:100 | 936 | 18.7 |
| Captan | 2:100 | 2873 | 57.5 |
| Zineb | 1:½:100 | 3188 | 63.8 |
| *Vancide Z65 (zinc salt) | 3:100 | 2349 | 47.0 |
| *Vancide F995W (manganese salt) | 2:100 | 1604 | 32.0 |
| *Vancide F956W (iron salt) | 2:100 | 2260 | 45.2 |
| Wettable sulfur | 6:100 | 399 | 8.0 |
| Water (check) | | 2769 | 55.4 |
| L.S.D. .05 | | 749 | |
| .01 | | 955 | |

*Mixture of the indicated metal salt of dimethyl-dithiocarbamic acid and 2-mercaptobenzothiazole.

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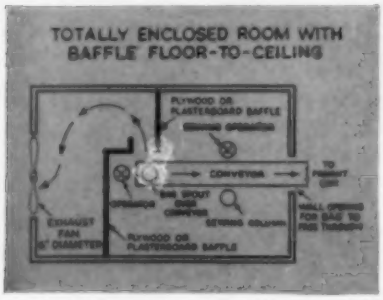


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# WASHINGTON Report

by
**Donald G. Lerch**
Cornwell, Inc., Washington, D. C.
(Agricultural Chemicals Washington Correspondent)

**SOME pesticide companies need a "gentle nudging" so that their residue tolerance problems can be "cleared" by the Food and Drug Administration before the summer deadline. That's what some industry men believe as they survey the size of the problem facing both the industry and the Food and Drug Administration as the provisions of the Miller Bill and the 1950 residue tolerance hearings are put into effect.**

**"A number of manufacturers will need to get tolerances established for their pesticides before July 22nd," Winton B. Rankin, Food and Drug Administration says.**

**"Therefore, Food and Drug has prepared to handle petitions promptly. It has estimated the number of petitions which will be received in the next few months and has established a staff large enough to process all of them by July 22nd, provided they are filed in the near future."**

**Rankin continues by saying, "Petitions will be processed in the order in which they are received. The sooner they are filed, the less danger there is of a bottle neck which will delay some beyond July."**

**Every company, of course, has its own policy and reasons for the timing of actions in this field. None-the-less, it appears that the staff Rankin speaks of is not particularly busy. It's up to company executives to decide whether to be first or last in line. All should know, however, that Food and Drug, in the language of the Pennsylvania Dutch has the "gate painted blue" and is waiting to have a host of interested parties enter.**

**AC**

*Senator Wayne Morse is becoming the center of what promises to be another "battle royal" on Government dam building in the West. His Hells Canyon Dam project is viewed by some as the start of another TVA. If such would be the case, it would be opposed by most of the fertilizer industry on the basis of the industry's historical position.*

*Fertilizer itself is not mentioned in the bill. However, the prospect of one million watts of power in an area which some claim encompasses 60% of the total phosphate deposits in the U. S. could not logically go unnoticed by the agricultural chemical industry. Hells Canyon, if built at public expense, would make public power available for the production of agricultural phosphate. The fertilizer associations would take a position on this matter only upon action of their boards of directors.*

*This is a proposal which has been "treading water" for some time and, until its send-off by Morse, was considered one of those issues in Washington that could be considered in leisure because it had a "long fuse." Morse had shortened the fuse.*

**AC**

"Too little but not too late" is the plea that True D. Morse, Under Secretary of Agriculture, puts to the pesticide industry. He feels, "There is too little information on the dollar and cents value for the farmers who want to step up their profits."

"Many farmers are confronted by a whole list of chemicals and formulas and are uncertain about which to use and what results to expect," Morse added.

The Under Secretary feels that the industry is providing a service to agriculture and that it can be of major importance in reducing the cost of farm production and by so doing increase the farmers' "take home pay."

The great force causing farmers to seek new ways and find new methods of reducing costs is the continuing drop in farm income. It declined 10% last year. Earlier estimates by Government officials, including testimony before Congressional committees, had placed the decline at about one half this amount. Not only did income drop but farm costs increased, taking still more from the farmers' "take home pay." Farm operating expenses rose by one per cent last year, resulting in an eleven per cent drop in the farmers' purchasing power—the lowest since 1940. The farmer was hit in still another way—his share of the consumer's food dollar fell to a 15 year low. Consumers in general have benefitted relatively little from the 25% drop which has occurred over the past three years.

All this doesn't mean that the farmer is a poor customer for industry products. A sometimes forgotten figure is to divide the number of farmers on farms today into farm income. On an over-all basis, farm income per capita is up for the reason that the number of farmers has declined. There are fewer people to divide the pie. An alert, hard-hitting merchandising sales job should build bigger sales this year than ever before.

**AC**

**While Washington argues over grain storage sanitation, the Khapra beetle is gradually spreading. Unknown in the U. S. until November of 1953, the Khapra beetle "could readily develop into a destructive pest in the South and in heated warehouses in the North," according to the conservative official statement of the USDA.**

**With record supplies of grain in storage in the U. S., and all kinds of specialists spurring work on cleaning up insects and rodents infesting grain, there still is little concrete evidence that progress is being made. The newly-elected President of the American Farm Bureau Federation heartily endorsed the aims of the clean up campaign, but added that the actual operation has to be on a practical basis, in keeping with the abilities of farmers and the grain trade.**

**The USDA's Grain Research and Marketing Advisory Committee considers "developing improved methods of conditioning, handling, and storing grain and expanded work on detecting and controlling insects in stored grain" as among the subjects requiring priority action in the research field.**

**Striking at the problem of grain sanitation from another angle, that is, education, the USDA Extension Service has appointed Clyde C. Noyes, of Lincoln, Neb., to speed up the national educational program through state extension services. The extension service has a clean grain program which has been in effect for years. It's up to Mr. Noyes to get it going in high gear.**

**AC**

*As more farmers develop irrigation—so should there be new markets for pest control chemicals. According to the information from the Columbia River Basin, mint was found infected with mint rust after the crop had been under irrigation. Mildew also has made in-roads.*

*Serious diseases are being found on sprinkler irrigated beans according to the USDA. Bean rust, pod rot, and root rot are exceptionally heavy. Because of the high investment required for irrigation, it becomes all the more important to control disease and insects to assure sufficient returns to make a profit.*

**AC**

The USDA Plant Disease Forecasting Service, headed by Dr. Paul Miller, is planning to add a new service. This year for the first time, lima bean mildew, highly important to growers in Delaware, Pennsylvania, New Jersey, and Maryland will be forecast on the basis of correlated temperatures and rainfall.

(Turn to Page 115)

# Technical SECTION

## TVA Plans '55 Fertilizer Production

LELAND G. Allbaugh, director of TVA's Division of Agricultural Relations, announced plans last month for testing TVA fertilizers. Dr. Allbaugh said that experiment stations will continue field tests of nitric phosphate and diammonium phosphate and will initiate field tests on a new product from TVA's Fertilizer-Munitions Development Center at Muscle Shoals. The new fertilizer product is ammonium metaphosphate.

"Nitric phosphates are combination fertilizers containing nitrogen and phosphorus in a plant available form," Dr. Allbaugh said. "Potash can be added during the manufacturing process to form a complete fertilizer. These materials are manufactured by reacting nitric acid or a mixture of nitric and either sulfuric or phosphoric acid with rock phosphate. The nitric phosphates will require extensive field testing to determine the effectiveness of the various materials under the many soil, plant, and climatic conditions where they may be used. They are high analysis materials. Typical grades are 17-22-0, 12-32-0, 14-14-14, and 12-12-12.

"Diammonium phosphate is a relatively new product and will be produced by TVA in demonstration operations for the first time this spring. It has been produced in a pilot plant, and some field-testing has been done since 1946. Diammonium phosphate has a very high analysis, 21-53-0, and is a completely water-soluble product. It is ideally suited for direct application in areas where potash in the soil is not deficient, and for upgrading fertilizer mixtures.

"Ammonium metaphosphate is a new product. Limited quantities are being manufactured in a pilot plant for the first time this spring. It has the highest analysis of any known fertilizer material, 17-73-0. Ammonium metaphosphate is produced by reacting $P_2O_5$ gas with ammonia and water. Preliminary greenhouse testing of this material has shown it to be a very satisfactory source of both nitrogen and phosphorus. However, field-testing of the material will be necessary before it can be adequately evaluated."

Other cooperative undertakings with the agricultural experiment stations during the coming season include the testing of fertilizers made from the high alumina leached zone phosphatic ore from Florida, Dr. Allbaugh said. "This ore is currently discarded," he added. "Its efficient use would greatly aid in the conservation of our important phosphorus resources. Tests are also being initiated to study the most economical rates of fertilization for corn under different soil and climatic conditions.

"New tests of calcium metaphosphate will be initiated as well as additional experiments to evaluate the importance of water-soluble phosphorus in various fertilizers." Dr. Allbaugh said that the test-demonstration farmers continue to set the pace in agricultural activities in the Tennessee Valley.

"Test-demonstration supervisors regard the farms as 'pilot' farms bridging the gap between research and the practical application of research findings. These farmers are the first to use TVA experimental fertilizers under actual farm conditions in complete well-rounded farming systems. Both research and extension workers cooperate in the test-demonstration activity. The test-demonstration farmer is also important as a connecting link between research with TVA fertilizers and the broader educational sales program of widespread introduction."

"Dr. Allbaugh stated that TVA's diammonium phosphate would be used on test-demonstration farms this spring for the first time." *TVA Weekly News Letters* February, 1955.

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### Prebloom Sprays Check Mites

European red mite on pear trees in California has been held in check by prebloom sprays of Genite-923 and of Mitox. Further treatment was unnecessary until July. Results of work done in the 1954 season in a mixed Hardy and Bartlett pear orchard also indicated that dormant oils controlled the mite until June and the oil-parathion combination was slightly superior to dormant oil-plus-malathion or dormant oil alone.

Both Genite-923 and Mitox as a cluster bud treatment for European red mite egg control on pears proved to be better than Karathane, Dimite, and chlorobenzilate. Early Sprays for Mite Control, Harold F. Madsen, *California Agriculture*, Vol. 9, No. 2, Feb., 1955.

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### Parathion Residues Studied

Unwashed celery can be sent to market from Florida with parathion residues below two ppm. if the recommended weekly dosages are applied and a seven-day weathering period is allowed. The conclusion is a result of study by the Florida Agricultural Experiment Station. Chemical analyses of parathion made on celery sprayed weekly for 2, 3 and 4 months to determine the amount of toxicant residues remaining on the crop at harvest time showed that four hours after the last application a 15, 12 and 9 weekly series resulted in 5.93, 5.37 and 5.25 ppm. parathion, respectively. Samples taken seven days after application from the series contained, respectively, 1.05, 0.96 and 0.87 ppm. parathion. Parathion Residues on Celery, *Journal of Economic Entomology*, Vol. 48, No. 1, Feb., 1955.

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## Soil Conditioners Lower Yields

A significant decrease in yield was obtained with increased rates of application of VAMA (modified vinyl acetate-maleic acid) and HPAN (hydrolyzed polyacrylonitril) to glaciated Williams loam subsoil, with sugar beets as the indicator crop.

Regardless of the improvement in soil structure, the lowering of yield was linear as application rate went up, with or without manure. Applications of 0, 500, 1,000 and 1,800 pounds per acre were used with rotilling to a depth of six inches with and without 20 tons of manure. Nitrogen and phosphorus were side dressed each at the rate of 100 pounds per acre.

VAMA produced a greater change in the physical condition of the soil than did HPAN. The Effect of Synthetic Soil Conditioners on Soil Structure and Production of Sugar Beets, Howard R. Haise, L. R. Jensen, and Joseph Alessi, *Soil Science Proceedings*, Vol. 19, No. 1, Jan., 1955.

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## Urea Compatible with Pesticides

No harmful effects need be expected from the combination of urea and pesticides in recommended spray programs, says the Agricultural Experiment Station of Rutgers University.

Various insecticides and fungicides were applied alone and in combination with urea at petal-fall and first and second cover sprays; also both water-sprayed and water-plus urea-sprayed checks were included in the test work on apple trees. Treatments included the use of wettable sulphur, captan, ferbam, lead arsenate, DDT, parathion, and urea (which was used at the rate of five pounds per 100 gallons of spray in all cases).

In the group of 25-year-old trees at Cranberry, N. J. used for the 1954 testing, no significant differences in fruit finish due to the incorporation of urea with any of the insecticides or fungicides was noted. *Agricultural News Letter*, E. I. DuPont De Nemours & Co., Inc., Vol. 23, No. 1, Jan.-Feb., 1955.

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## Nitrogen Dioxide a Fertilizer?

Spurred by the availability of a cheaper source of nitric acid (from Food Machinery and Chemical Corp.'s pilot plant) a determined investigation with nitric acid as a fertilizer was conducted. Results reported in 1953 were favorable. An intermediary product in the production of nitric acid by the Food Machinery process is nitrogen dioxide and its potential as a fertilizer is now being studied.

Preliminary reports show that injected liquid nitrogen dioxide is readily absorbed by soil. Losses as gaseous nitrogen dioxide or nitric oxide are less than one percent. In acid, neutral, or unbuffered alkaline soils, injected liquid nitrogen dioxide produces a sufficiently acid soil reaction to insure rapid and complete chemical oxidation to nitric acid. In highly buffered alkaline calcareous soil the injected liquid nitrogen dioxide produces little change in soil reaction and is only partially oxidized to nitric acid.

Approximately one third of the nitrogen injected exists temporarily as nitrous acid. Laboratory Studies of Reactions Between Injected Liquid Nitrogen Dioxide and Various Soils, with Special Reference to Its Possible Use as a Fertilizer, D. G. Aldrich and J. R. Buchanan, *Soil Science Proceedings*, Vol. 19, No. 1, Jan., 1955.

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## Fall Boron Sprays Effective

Good control of blossom blast and twig dieback of pears in southwestern Washington was obtained when boron spray (as borax 3:100 or Polybor 1 and 2:100) were applied in the fall.

Soil applications of boron to control this disorder, shown to be a boron deficiency, gave erratic results, as did the element, applied as a foliar spray (Polybor 1:100) in June. Bartlett, Anjou and Bosc varieties are susceptible to the disease. Fall Application of Boron Sprays as a Control for Blossom Blast and Twig Dieback of Pears, Folke Johnson, D. F. Allmendinger, V. L. Miller, and Dorothy Polley, *Phytopathology*, Vol. 45, No. 2, Feb., 1955.

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## Strawberry Weeds Controlled

A combination of chemical applications consisting of a pre-planting treatment of CIPC or DNBP, followed by post-planting treatment of SES at 30 day intervals or as needed, and CIPC or DNBP applied for control of chickweed and other winter annual weeds when strawberries were dormant, result in excellent weed control without injury to strawberry plants. These results, from a cooperative study between the Horticultural and Field Crop Research Branches, Agricultural Research Service, U.S.D.A., and Department of Horticulture, University of Maryland, indicate that hand hoeing to control weeds is generally unnecessary.

Weed control in strawberries was considered as a three-phase problem: (1) control of early-germinating weeds by pre-planting treatments, (2) control of summer annuals by post-planting treatments, and (3) control of winter annual weeds by applying herbicides in late fall or during the winter while plants were dormant.

Pre-planting treatments were effective for controlling weeds early in the season in new plantings of strawberries on loam soil, less effective on light sandy soil. DNBP at eight pounds per acre was the most satisfactory pre-planting treatment. CIPC at six pounds per acre as a pre-planting treatment injured strawberry plants in one experiment but not in two others. Control was excellent for 30 days.

Seven post-planting treatments with SES at three pounds per acre at monthly intervals did not damage strawberry plants and gave very good control of weeds for four weeks after each application Sesin appeared promising for post-planting use and may be of value for pre-planting treatments.

CIPC at three pounds per acre applied either in mid-November or mid-February to dormant strawberry plants gave excellent control of chickweed without damage to plants.

A single application of DNBP at one or two pounds per acre in mid-February gave better control of weeds at harvest time than a split application of one lb. in mid-November and one lb. in mid-December.

The number of runner plants produced by a specific date was found to be a sensitive indicator of the effect of herbicides on strawberries and an adequate response index to use for the evaluation of new chemicals for weed control in strawberries. D. H. Scott, W. C. Shaw, and R. U. Ruppenthal, *Weeds*, Vol. III, April 1954, No. 2.

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## Crag Fly Repellent Tested

E. S. Raun of Iowa State College, Ames, Iowa, has reported success with Crag fly repellent in treadle spray formulations. Dr. Raun observes that the horn fly count was reduced from 600 to 50 per animal in cattle applications of the chemical. Crag is a product of Union Carbide and Carbon Corp., New York.

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## $NH_3$ Valuable as Fungicide

In addition to the primary use of anhydrous ammonia as a fertilizer, destruction of plant parasitic nematodes in nitrogen retention zones suggests its application as a fungicidal agent in soil. Knife-type injectors which apply anhydrous ammonia to soil produce large concentrations of ammonia in localized areas. Numbers of fungi and nematodes were reduced by all levels of ammoniacal nitrogen from 136 to 741 ppm. in a recent study by the Florida Agricultural Experiment Station. Compared to untreated soil, only 0.6 per cent of the nematodes and 4.9 per cent of the fungi survived when 608 ppm. of nitrogen were present in the soil. This level of ammoniacal nitrogen occurs regularly in the retention zone when anhydrous ammonia is applied in the field. Largest reduction in both nematodes and fungi occurred above 365 ppm. The Effect of Anhydrous Ammonia on Nematodes, Fungi, Bacteria, and Nitrification in Some Florida Soils, Charles F. Eno, William G. Blue, and Joseph M. Good, Jr., *Soil Science Proceedings*, Vol. 19, No. 1, Jan., 1955.

## England Reports Weed Studies

CMU proved effective in killing the following weeds: *Capsella bursa-pastoris* and *Poa annua*, applying less than 0.25 pound per acre; *Chenopodium album*, *Stellaria media*, *Spergula arvensis*, and *Senecio vulgaris*, requiring 0.5 pound per acre; *Polygonum aviculare*, requiring one pound per acre; and *Veronica hederifolia* and *Fumaria officinalis*, applying about two pounds per acre.

Carrots and red beet were unaffected by rates of up to 0.5 pound CMU per acre; but this rate applied to onions caused reduction in stand and yield.

Potassium cyanate as a post-emergence spray on onions, pentachlorophenol (as a micronized suspension and as the sodium salt) applied to onions and red beets, and Endothal (di-sodium 3,6-endoxohexahydrophthalate) as a pre-emergence spray for beets were all ineffective in controlling weeds. Pentachlorophenol applied in vaporizing oil and as oil-water emulsions gave good weed control on lettuce without injuring the crop. H. A. Roberts, 4th Annual Report, National Vegetable Research Station, Wellesbourne, Warwick, England, 1953, p. 36-37, 1954; (through Chemical Abstracts, Vol. 49, No. 2, Jan. 5, 1955.)

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## Antibiotics for Pear Blight

Agri-mycin 100 (15 per cent streptomycin and 1.5 per cent terramycin plus wetting and solidifying agents and an inert carrier) was applied at three concentrations, three or four times at 14-day intervals and five or seven times at 7-day intervals to bearing Bartlett pear trees in Marysville, Calif. Other trees were treated with Agri-mycin 100 plus zineb; others with tribasic copper sulfate five or seven times at 7-day intervals. Results indicated that the number of blight infections decreased as the number and concentration of antibiotic sprays increased, although extra spraying after April 26 had no significant effect.

Except with the strongest spray, tests at 7-day intervals gave better control than those 14 days apart. Zineb did not add any blight control benefit to the spray. Results with five or seven applications of 30-3ppm. antibiotic were as good as those with one pound per gallon tribasic copper sulfate; those with higher concentrations were better.

Agri-mycin 100 did not russet the fruit as the copper did but some chlorosis of the early leaves was noted. John C. Dunegan, Jess R. Kienholz, R. A. Wilson and W. T. Morris, U.S.D.A., Beltsville, Md., *Plant Disease Reporter*, Vol. 38, p. 666-669, 1954.

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## Correction

Granulite Co., Chicago, marketing Granulite Ag-Slag, advise that the title "Phosphatic Fertilizer from Blast Furnace Slag" (Feb. AC, p. 75) may be misinterpreted. They wish to point out that water granulated slag is not a phosphatic fertilizer, although it does by content of soluble silica aid in releasing soil phosphate to the plant. The secondary values of blast furnace slag beyond its superior liming values have not been completely researched.

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## Mist Blower Spraying

Typical of new applications is the use of an A.B. Farquhar Iron Age mist blower spraying a mixture of xylene type DDT emulsion and rotenone, to control tuliptree scale insect. Kill of all young scales was estimated at 85-90 per cent. Recovery of trees from the infestation the following year was good.

In another application, the city of Hammonton, N.J., facing a problem of heavy infestation of 60-year-old sycamore trees, used a Bean Rotomist sprayer and treated the trees (some reaching 90 feet in height) with a five per cent solution of Orthol D. Excellent results were reported.

Test results on a southern New Jersey estate showed that trees sprayed with DDT, parathion, Marlate and Rhothane were effectively relieved of infestations of canker-worm larvae and small oak leaf miner larvae. Also, no evidence of pin oak sawfly larvae and no plant injury to the foliage from the sprays was noted. Developments in Mist Blower Spraying, Clyde C. Hamilton, *Trees Magazine*, Vol. 15, No. 2, Jan.-Feb., 1955.

## USDA Reports on Oil Parathion

Oil and parathion are more effective when combined into a single orchard spray according to a report by USDA California entomologists. Research at the Whittier, Calif. station of the USDA Agricultural Research Service has indicated that: (1) Against the California red scale on lemon and orange trees, the most effective treatment is one gallon of oil and one pound of 25 per cent parathion per 100 gallons of spray. (2) Against the citrus red mite on these same trees, best combination is 1.8 gallons of oil and ½ pound of 25 per cent parathion.

Caution is recommended in the use of these combination sprays since they may cause excessive leaf drop, fruit drop and, especially in oranges, twig dieback. USDA research workers have developed a lighter than normal oil to prevent some of the damage. But farmers are advised to use the combination on a limited scale until further information is accumulated.

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## New Geigy Herbicide

Geigy Agricultural Chemicals announced a new herbicide for cotton at the Southern Weed Conference held in January. Designated as Geigy 444," the compound is 2-chloro-4, 6-bis- (diethylamine) -s- triazine. It has given good results as a pre-emergence and post-emergence herbicide, in directed as well as overall applications. Rates as high as 24 lbs. per acre have been applied as pre-emergence treatments without phytotoxic effects. Directed and over-all post-emergence sprays, applied at a rate of 12 lbs. of Geigy 444 per acre produced no reduction in growth. Slight burning resulted from overall applications.

Preliminary greenhouse tests have indicated that "Geigy 444" may be used successfully on other crops including lima beans and peas. In green house tests conducted at the Geigy Research Laboratories in Bayonne, N. J., nutgrass (Cyperus esculentus) was killed with post-emergence applications using the material at the rate of 20 lbs. per acre. Indications are that spot treatments using 1 lb. of "Geigy 444" in 5 gals. of fuel oil are effective in killing nutgrass. Good to excellent control of most broadleaved weeds and annual grasses has been obtained with applications of "Geigy 444" ranging from 4 lbs. to 24 lbs. per acre. Excellent weed control has been obtained for periods up to nine weeks at the Geigy Research Farm in Maryland.

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## Trace Elements Raise Yields

Addition to soil of N-P-K fertilizer along with copper, zinc and manganese sulfates at 5-10 mg. per kg. of soil as well as strontium chloride and boric acid at 2.5-5 mg. per kg., raised the crop yield of wheat, poppy, mustard, flax and mushrooms, at rates ranging upward of 45 per cent. Seed pretreatment with these trace elements in similar concentrations for 6-12 hours also aided crop yield, general plant growth and the content of fats and oils in the oil-bearing plants. Mixed trace elements gave better results than individual metals. "Effect of Presowing Treatment of Seeds With Solutions of Trace Elements on the Crop of Agricultural Plants," A. Z. Lambin, S. M. Kirov Agr. Inst., Omsk; through *Chemical Abstracts*, Vol. 49, No. 1, page 552.

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## Report Potatoes Injured

Annual addition, to light soils with feeble buffering, of acidic mineral fertilizers results in accumulation of amounts of manganese and $P_2O_5$ in potato plants leading to disease and death.

Accumulation of mobile aluminum in the soil causes an increase in level of mobile manganese and iron. Ratio of aluminum to phosphoric acid is more important than actual amount of aluminum. Addition of manure stopped potato crop loss under conditions of high aluminum content. Liming of soil prior to field sowing is recommended. "Effect of Manganese, Aluminum and Iron on Potatoes in Sandy Soils," N. S. Arkhangel'skaya (Ministry of Agriculture, U.S.S.R., Moscow); through *Chemical Abstracts*, Vol. 49, No. 1, page 553.

## Literature Available

The following list reviews a series of bulletins on fertilizer, insecticide and fungicide recommendations, controls, etc. For the most part, these bulletins and reports are prepared by the various state agricultural experiment stations, and copies may be obtained by writing directly to the respective stations.

A Review of the Known Facts About the Khapra Beetle, by R. T. Cotton. A four page monograph containing a bibliography with 16 entries. Publication of the USDA, Agricultural Marketing Service, Biological Sciences Branch, Stored-Product Insects Section, Richmond.

Control of Downy Mildew of Cabbage with Fungicides. Results of tests with several materials to control downy mildew. Gives fungicides used in plant beds and on heading cabbage and the results obtained, and makes recommendations for control. Bulletin 543, Florida Agricultural Experiment Station, Gainesville, Fla.

Aratron: Estonmite-50W. Bulletin by Eston Chemicals Div., American Potash & Chemical Corp., Los Angeles, on control of spider mites.

Sixty-Seventh Annual Report of the Director Mississippi Agricultural Experment Station for the Fiscal Year Ending June 30, 1954, compiled under the direction of Clay Lyle and Henry H. Leveck. A digest of the 1954 work of the Mississippi Agricultural Experiment Station, including summaries prepared by each department head and branch station superintendent. Published by Mississippi State College, State College, Miss.

Pflanzenschutz und Schadlingsbekampfung, in German by Dr. R. Maag Ag., Dielsdorf-Zurich. An outline of plant disease and the latest procedures for control. Contains numerous illustrations of noxious insects and damaged plants, one double page in color. Published by the author at Zurich, Switzerland.

Apple and Peach Spray Schedules for 1954. Contains a "better finish schedule for growers" who wish to produce larger yields of high-quality apples and a standard or low cost schedule. Leaflet, Agricultural Extension Service, College of Agriculture, Pennsylvania State University, State College, Penn.

Official Publication, Association of American Fertilizer Control Officials. This edition contains a summary of fertilizer registration and tax legislation in the various states, a chapter on the use of warning and caution statements in labeling fertilizer products, a discussion of plant trends during the last twenty years, and eighteen other articles. No. 8, 1954, A. A. F. C. O. Official Publication.

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# INDUSTRY *Patents*

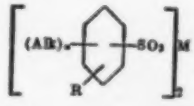
**The data listed below is only a brief review of recent patents pertinent to the readers and subscribers of this publication.**

**Complete copies of these patents may be obtained by writing to the publisher of this magazine and remitting 50¢ for each copy desired. For orders received outside of the United States the cost will be $1.00 per copy.**

2,691,358. FERTILIZER FLOW CONTROLLER. Patent issued Oct. 12, 1954 to Alvin W. Peck, Bartlesville, Okla., assignor to Petroleum Co., Delaware. An implement-mounted dispensing system for the direct application of ammonia to soil comprising, in combination, a wheeled vehicle adapted to travel along the ground, a cultivator shoe attached to said vehicle, said shoe being adapted at its extremity to produce a furrow in the ground as the vehicle is moved forward, a liquid ammonia storage tank rigidly mounted on said vehicle, a normally closed diaphragm operated valve assembly having a fluid inlet connection and a fluid outlet connection and a flexible diaphragm, a valve seat within said fluid inlet connection, a conduit attached to said fluid inlet connection and leading from said ammonia storage tank, a valve having a head and a stem, said head being disposed within said fluid inlet connection and said stem being operably attached to said diaphragm for imparting movement to said valve head, a tube head, a tube leading from the outlet connection of said valve to a point near the lower extremity of said shoe for applying ammonia to the soil, an oil storage reservoir and an oil pump mounted on said vehicle, a conduit leading from said oil storage reservoir to the inlet side of said pump, a conduit leading from the pressure outlet side of said pump to the diaphragm valve assembly on the side of the diaphragm opposite the valve stem, the diaphragm being adapted to open said valve upon a predetermined oil pressure from said pump, a power take-off on said vehicle for operating said pump when the vehicle is moving in a forward direction, and an oil return line from the diaphragm valve assembly on the side of the diaphragm opposite said valve stem to the oil storage reservoir.

2,695,218. APPARATUS FOR MAKING ORGANIC FERTILIZER. Patent issued Nov. 23, 1954, to Eric W. Eweson, Newport, R. I. Apparatus for making organic fertilizer, comprising a tank, a plurality of superimposed spaced, parallel grids, extending horizontally across the interior of the tank and each comprising a plurality of spaced bars forming a platform supporting material resting thereon, a relatively thin scraper blade having a flat side resting on and supported by the upper edges of the bars of each of said grids, and operating members connected to opposite edges of each of said scraper blades and extending through opposite sides of the tank wall and adapted to reciprocate said scraper blades on said grids.

2,696,453. EMULSIFIERS AND TOXICANTS CONTAINING THE SAME. Patent issued Dec. 7, 1954 to Herbert L. Sanders, Edward A. Knaggs, and Marvin L. Nussbaum, Chicago. 1. An agricultural and livestock composition for use in conjunction with organic solutions of water-insoluble toxicants, which, upon the addition thereof to soft as well as hard waters, forms a fine dispersion therein of said toxicants, said composition containing (*a*) at least one member selected from the group consisting of higher molecular weight ethers and thioethers of polyoxyalkylene glycols and higher molecular weight carboxylic acid esters of polyoxyalkylene glycols, the higher molecular weight radicals containing from 8 to 22 carbon atoms and the polyoxyalkylene glycol radical having a molecular weight between about 200 and 6000, the polyoxyalkylene glycol being selected from the group consisting of polyoxyethylene glycols and polyoxypropylene glycols, and (*b*) an oil-soluble compound corresponding to the formula




where Alk is an alkyl radical, *n* is an integer from 1 to 3 with the proviso that (Alk)*n* contains from 8 to 18 carbon atoms, R is a member selected from the group consisting of methyl, phenyl, hydroxy-phenyl and hydroxyl, and M is an alkaline earth metal selected from the group consisting of calcium and magnesium, said ingredient (*a*) and said ingredient (*b*) being present in proportions to each other ranging from about 9 to 1 to about 1 to 9.

2,696,696. APPLICATOR FOR WEED-KILLING LIQUID. Patent issued Dec. 14, 1954 to Louis Tigerman, Milwaukee, Wis., assignor to Tigerman Co., Inc., Milwaukee, Wis., a corporation of Wisconsin. 1. An applicator for liquid for killing weeds mingled with grass including a member movable along the ground, grass cutting means on said member to throw grass clippings upwardly and outwardly of said means in an arcuate path, a ground engaging roller connected with said member for movement along the ground therewith, said roller being positioned below said arcuate path to contact the area cut by said cutting means while said area remains uncovered by said clippings, a distribution tube for liquid for killng weeds carried by said member and positioned directly over said roller and between said roller and said arcuate path, said tube having a plurality of outlets from which liquid for killing weeds drops in non-spray onto said roller to form a film of liquid for killing weeds on said roller free from grass clippings in said arcuate path.

2,697,094. FUNGICIDAL PRODUCTS OF CELLULOSE ETHERS. Patent issued Dec. 14, 1954 to Friedrich Becke, Dad Duerkheim, and Oskar Flieg, Limburgerhof (Pfalz, Germany), assignors to Badische Anilin- & Soda-Fabrik Aktiengesellschaft, Ludwigshafen am Rhine, Germany. 2,6-dinitro- 4, 5-dichlorophenyl ethers of cellulose.

2,697,937. SOIL TESTING EQUIPMENT AND GROUND ANCHOR FOR THE SAME. Patent issued Dec. 28, 1954 to Albert Zabriskie Richards, Jr., Salt Lake City, Utah. A soil testing device comprising a portable earth anchor consisting of a plurality of separate members, the latter including anchor stages adapted to be inserted into preformed holes in the ground and, when inserted, inclined towards each other and towards the horizontal, said stakes being provided with bores intermediate the ends and at right angles to the respective axes of the stakes, a cross beam for joining the anchor stakes, provided with bifurcated ends having check plates provided with bores, adapted to straddle the anchor stakes, so as to align the bores in the cross beam with the bores of the anchor stakes, removable bolts inserted through the aligned bores, thus joining the anchor stakes pivotally to the cross beam, lugs intermediate the ends of the crossbeam provided with aligned bores projecting from said cross beam, means on the upper ends of the anchor stakes to draw said ends together, a soil testing plate and column, and a loading beam provided with a transverse bore at one end, adapted to be applied against the column and the soil testing plate, and a detachable pivot bolt pivotally connecting said loading beam with the lugs of said cross beam inserted through the transverse bore of the loading beam and bores in the lugs of the cross beam, said loading beam being weighted for applying pressure to the soil testing plate, while the reaction is taken up by the earth anchor.

# PAY DIRT

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2,698,252. LIME-FLY ASH COMPOSITIONS FOR STABILIZING FINELY DIVIDED MATERIALS SUCH AS SOILS. Patent issued Dec. 28, 1954 to Jules E. Havelin, Havertown, and Frank Kahn, Philadelphia, Pa. A stabilized soil composition of matter consisting essentially by weight of about 10% to about 30% inclusive of crude fly ash, about 70% to about 90% inclusive of soil having a fineness modulus below 1.7, the sum of the percentages of crude fly ash plus soil being substantially equal to 100, and about 2% to about 9% inclusive of lime, the percent lime being based on the weight of crude fly ash plus soil.

2,698,304. EMULSIFIER COMPOSITION. Patent issued Dec. 28, 1954 to Konrad Henkel and Alfred Rapp, Dusseldorf, Germany, assignors to Bohme Fettchemie G. m. b. H., Dusseldorf, Germany. A composition for producing stable emulsions of water and oil, consisting of a sulfonamide having the general formula R—$SO_2$—$NH_2$ and about 3 parts by weight of a water-soluble salt of a disulfimide having the general formula R—$SO_2$—NH—$SO_2$—R′ for each part by weight of sulfonamide, in which R represents a higher alkylbenzene radical wherein the alkyl group has a medium chain of 12 carbon atoms, and R′ represents the radical of a hydrocarbon selected from the group consisting of benzene, toluene, tetraline, dekaline, and a higher alkyl-benzene wherein the alkyl group has a medium chain of 12 carbon atoms.

2,698,820. PESTICIDAL COMPOSITIONS AND THEIR USE. Patent issued Jan. 4, 1955 to Jack S. Newcomer, Grand Island, N. Y., assignor to Sharples Chemicals, Inc., a corporation of Delaware.

A composition prepared for use in combating micro-organisms and insects which comprises a surface active agent, and at least one of the group consisting of 1,1,5-trichloro-4-pentene-2,3-dione and 1,1,3,5,5-pentachloro-3-penten-2-one, said composition forming an emulsion with water upon agitation therewith.

2,699,255. CONCENTRATION OF SYLVITE FROM SYLVINITE ORE. Patent issued Jan. 11, 1955 to Earl H. Brown, Hibbing, Minn., and Tom A Cecil, Mulberry, Fla., assignors to Minerals & Chemicals Corp. of America, a corporation of Maryland.

The improvement in the method of concentrating sylvite from a sylvinite ore in a pulp formed with a saturated aqueous solution of the soluble ore constitutents and conditioned with a collector selected from the class consisting of aliphatic amines containing a straight chain alkyl group having from 8 to 18 carbon atoms and their salts with water soluble acids, which results from distributing in said pulp a useful amount of crude starch xanthate.

2,699,419. PESTICIDAL COPPER CHROMATES AND METHOD OF MAKING AND APPLYING SAME. Patent issued Jan. 11, 1955 to Fred R. Whaley, Kenmore, Carleton N. Smith, Snyder, and Richard H. Wellman, Hastings on Hudson, N. Y., assignors to Union Carbide and Carbon Corp., a corporation of New York.

A pesticide comprising a basic chromate containing copper and having a copper to chromium ratio of from greater than 3 to about 6 moles of copper to 1 mole of hexavalent chromium and having an X-ray pattern showing strong lines at values of 20 of 13.6, 22.3, and 35.5 under copper Ka radiation, the chromate being substantially free from copper hydroxide and such as is prepared by incorporating $CrO_3$ into $Cu(OH)_2$ and reacting the $CrO_3$ with the $Cu(OH)_2$ in the said copper to chromium molar ratios, the color of the chromate varying from a yellow brown to a light green to an olive green as the amount of copper reacted with the chromium increases within said limits.

2,699,629. PROCESS OF PREPARING MULCH FOR AGRICULTURAL PURPOSES. Patent issued Jan. 18, 1955 to Kurt Wandel, Honey Brook, Pa., assignor, by mesne assignments, to Wilbro Corp., Hackensack, N. J., a corporation of New Jersey.

The method of utilizing refuse containing garbage and other fresh organic matter of a character subject to putrefaction to the cultivation of growing plants which consists in subjecting such refuse to mechanical disintegration in the presence of water sufficient for the solid content of the mixture to be not more than 8 per cent, continuing the disintegration for such period that any contained waste paper or like fibrous matter is separated into its constituent fibers and the mass is reduced to a free-flowing pulp which is substentially free from odor and no longer subject to putrefaction, and then spreading the pulp on the ground adjacent the location of the growing plants.

## Trade Mark Applications

RED ARROW, in capitals within drawing of leaf with arrow, for insecticides, fungicides, and weed killer. Filed May 27, 1954 by McCormick & Co., Inc., Baltimore, Md. Claims use since on or about Jan. 15, 1928.

VET-X, in block capitals, for insecticidal spray and deodorant for animals. Filed July 1, 1953 by Bridgeport Brass Co., Bridgeport, Conn. Claims use since June 10, 1953.

ADORNA, in outline letters, for organic fertilizer. Filed April 8, 1953 by Valley Feed & Supply Co., Inc., Spring Valley, N. Y. Claims use since Mar. 3, 1953.

URASOL, in capitals, for fertilizer solution containing urea and ammonia. Filed May 10, 1954 by Grace Chemical Co., New York. Claims use since April 22, 1954.

VER-MIC, in capitals enclosed by oval, for soil conditioner and plant food. Filed July 3, 1953 by Mikolite Corp., Encampment, Wyo. Claims use since on or about May 12, 1953.

AG. CHEM., in script letters enclosed by triangle, for foliar nutrient. Filed May 17, 1954 by Agricultural Chemicals, Inc., Walnut Grove, Calif. Claims use since Mar. 12, 1954.

M S CO., in capitals of various sizes with the latter three enclosed within the M and with a drawing of mushrooms; for organic plant food for mushroom composts. Filed May 20, 1954 by Mushroom Supply Co., Toughenamon, Pa. Claims use since June 1953.

GRAN-U-PELS, in capitals, for plant food. Filed May 3, 1954, by Swift & Co., Chicago. Claims use since about Feb. 3, 1954.

SUFFOKATO, in capitals enclosed by shaded triangles on top and bottom, for economic poisons in the nature of an insecticide for fumigating grains. Filed Jan. 25, 1954, by Douglas Chemical Co., d. b. a. Douglas Chemical Co., Inc., North Kansas City, Mo. Claims use since January 1953.

GRACO, in capitals, for urea fertilizer compound. Filed June 2, 1954, by Grace Chemical Co., New York. Claims use since May 26, 1954.

NUTRI-HEME, in shadowed capitals, for liquid fertilizer. Filed June 7, 1954, by Vernon Laboratories, Inc., d. b. a. Nutri-Heme Products, Los Angeles. Claims use since May 10, 1954.

HERCULES, in italic capitals with a drawing of Hercules, for fertilizer compounds. Filed March 30, 1954, by Hercules Powder Co., Wilmington, Del. Claims use since Feb. 13, 1954.

HOSE-MIX'T, in capitals with drawing of sprayer, for insecticides and fungicides. Filed June 9, 1954, by International Research Corp., Danbury, Conn. Claims use since May 1, 1954.

NITRA-FLO. Anhydrous ammonia for use as fertilizer. Filed Nov. 2, 1953 by Plantation Anhydrous Amonia Corp., Houma, La., now by change of name Plantation Fertilizers Corp. Claims use since Aug. 1, 1953.

AG-AMM. This in outline letter within diamond center describing anhydrous ammonia. Filed Jan. 21, 1954 by Mid-South Chemical Co., Memphis, Tenn. Claims use since Nov. 1, 1953.

GOPHER-GASSER. This in heavy capital letters, for pest exterminating gas cartridge. Filed July 2, 1953 by James G. Jefferys, Jeff Products Co., Burbank, Calif. Claims use during the year 1944.

BROAD FAN, in capitals, for spray nozzles for use in agricultural spraying of weeds and insects. Filed P. R. Nov. 13, 1953 by O. W. Kromer Co., Minneapolis, Minn. Claims use since Feb. 3, 1953.

# PHILLIPS OFFERS

# 5 FERTILIZER MATERIALS FOR HIGH ANALYSIS MIXTURES

## 1 AMMONIUM SULFATE

New Premium Quality Phillips *66* Ammonium Sulfate contains 21% nitrogen, 23.8% sulfur. It is *dry*-cured to remove excess moisture—prevent caking. Uniform, dust-free crystals flow freely—mix easily. Ideal for all analyses of mixed goods and for direct application. Available in bags or bulk.

## 2 ANHYDROUS AMMONIA

Phillips *66* Agricultural Ammonia contains 82% nitrogen. It's a convenient, economical source of nitrogen for formulation. Tank car shipments are assured to Phillips contract customers by Phillips huge production facilities in the Texas Panhandle and at Adams Terminal near Houston, Texas.

## 3 NITROGEN SOLUTIONS

Get more N per dollar! There are three Phillips *66* Nitrogen Solutions for use in preparation of high-analysis fertilizers and the ammoniation of superphosphate. These solutions keep handling costs low, help rapid, thorough curing.

## 4 AMMONIUM NITRATE

Phillips *66* Prilled Ammonium Nitrate contains 33% nitrogen. The small, coated prills or pellets resist caking . . . handle easily. Depend on Phillips *66* Prilled Ammonium Nitrate for uniform, free-flowing properties in formulations and top-notch crop response as a direct application material.

## 5 TRIPLE SUPERPHOSPHATE

Phillips *66* Triple Superphosphate contains 46% available phosphoric acid. Ideal for use in formulation of high analysis fertilizers.

Phillips 66

## PHILLIPS CHEMICAL COMPANY

A Subsidiary of Phillips Petroleum Company, Bartlesville, Oklahoma

Offices in:

AMARILLO, TEX.—*First Nat'l Bank Bldg.*
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HOUSTON, TEX.—*1020 E. Holcombe Blvd.*
INDIANAPOLIS, IND.—*1112 N. Pennsylvania St.*
KANSAS CITY, MO.—*500 West 39th St.*
MINNEAPOLIS, MINN.—*212 Sixth St. South*
NEW YORK, N. Y.—*80 Broadway*
OMAHA, NEB.—*WOW Building*
PASADENA, CALIF.—*604 Citizens Bank Bldg.*
RALEIGH, N. C.—*804 St. Mary's Ave.*
SALT LAKE CITY, UTAH—*68 South Main*
SPOKANE, WASH.—*521 E. Sprague Ave.*
ST. LOUIS, MO.—*4251 Lindell Blvd.*
TAMPA, FLA.—*1214 South Dale Mabry*
TULSA, OKLA.—*1708 Utica Square*
WICHITA, KAN.—*501 KFH Building*

# New **ARMOUR** herbicide emulsifier gives stability and flash dispersion for as little as 7¢ per gallon of concentrate!

Only 2% of Armour's new Emulsifier 1917 per weight of toxicant is required to formulate the most potent herbicide emulsions! Current emulsifiers require usages of 5% for even average performance. This means 1917 cuts emulsifier costs more than half — as low as 7¢ per gallon of concentrate!

Emulsifier 1917 gives superior performance with both volatile *and* low volatile esters of 2, 4-D and 2, 4, 5-T. It gives immediate dispersion, rapid spreading and coverage with minimum run-off and loss.

Here are the current results of a continuing stability test with this product: a 44% emulsifiable concentrate of a 2, 4-D ester and kerosene containing 2% of Emulsifier 1917 has been stored at room temperature for more than 1½ years with no change! There has been no separation of oil, emulsifier or toxicant. Emulsifiability and stability are excellent, solution completely clear, and there is no corrosion of the container whatever.

See for yourself how Emulsifier 1917 gives better emulsions—and cuts costs. Send the coupon for test samples of 1917 today!

ARMOUR CHEMICAL DIVISION

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1355 W. 31st Street, Chicago 9, Illinois

**MAIL THIS COUPON TODAY!**

Armour Chemical Division
1355 West 31st Street, Chicago 9, Illinois

Please send me:

☐ Free sample of Emulsifier 1917 and Product Data Bulletin.

Name _____ Title _____

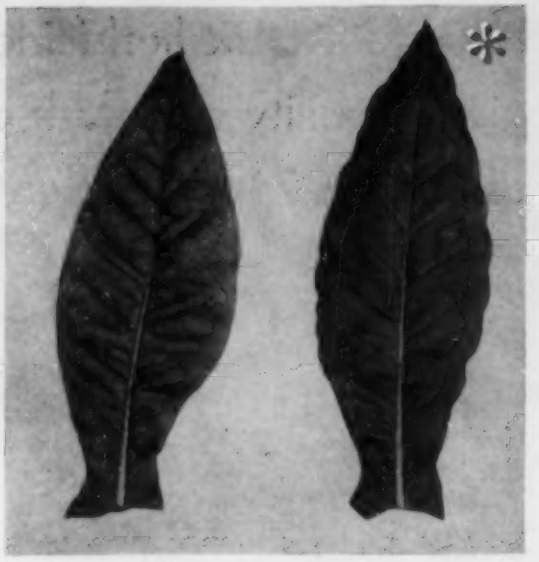
Firm _____

Address _____

City _____ Zone _____ State _____

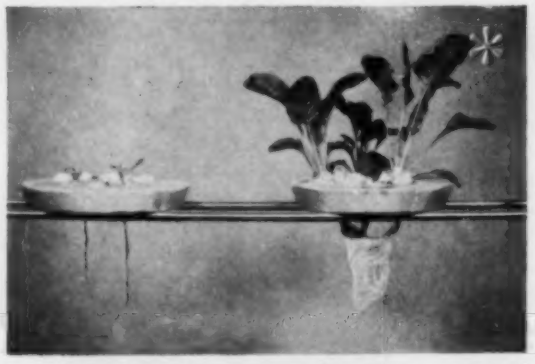
A4

WHIPTAIL — Moly-deficiency disease common in such crops as broccoli, brussels sprouts, turnips. Shown here in cauliflower. Young leaves are long and narrow, irregularly shaped. Leaf tissue does not develop normally from midrib. Midrib left bare in places.



INTERVEINAL MOTTLING—As example, moly-deficient tobacco shown here. Leaves in young plants turn pale yellow between veins and sometimes around margin. Veins remain green giving leaf mottled appearance. Pale areas develop into clearly defined yellow spots.

PALE CUPPED LEAVES— Overall pale coloration appears in many moly-deficient plants, like tomato on left. Leaves often curl or cup upward around edges.



STUNTED GROWTH— In sugar beet plants compared here, deficient plant on left made almost no growth of roots or tops. Small moly deficiencies retard crop yield.

# *Moly MAKES THE DIFFERENCE

Here's moly at work. You can recognize some signs of moly starvation on sight – others require testing. Make your own test for a few cents an acre. Write for our Bulletin Ag-4—"Testing for Molybdenum Deficiency." Dept. 43, Climax Molybdenum Company, 500 Fifth Avenue, New York 36, New York.

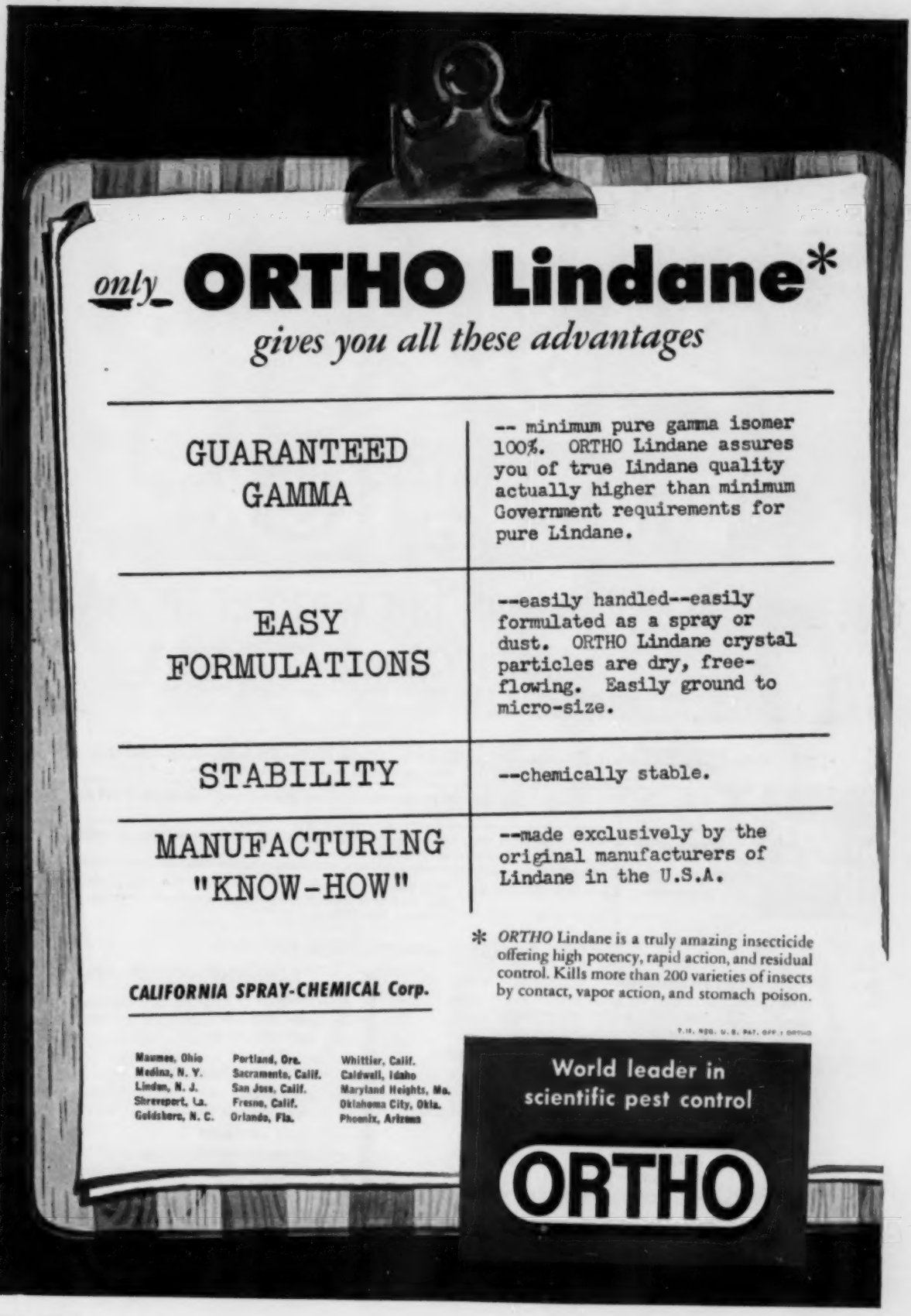
*learn why, first hand*

***A little moly in each ton of fertilizer is BIG crop insurance***

This advertisement is printed in one shade of molybdenum orange, a pigment widely used for its striking color and good coverage — ideal in paint for farm and field equipment.

MA5-15

**CLIMAX MOLYBDENUM**


only ORTHO Lindane*
gives you all these advantages
GUARANTEED GAMMA
-- minimum pure gamma isomer 100%. ORTHO Lindane assures you of true Lindane quality actually higher than minimum Government requirements for pure Lindane.
EASY FORMULATIONS
--easily handled--easily formulated as a spray or dust. ORTHO Lindane crystal particles are dry, free-flowing. Easily ground to micro-size.
STABILITY
--chemically stable.
MANUFACTURING "KNOW-HOW"
--made exclusively by the original manufacturers of Lindane in the U.S.A.
* ORTHO Lindane is a truly amazing insecticide offering high potency, rapid action, and residual control. Kills more than 200 varieties of insects by contact, vapor action, and stomach poison.
CALIFORNIA SPRAY-CHEMICAL Corp.
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Medina, N. Y.
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Shreveport, La.
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Portland, Ore.
Sacramento, Calif.
San Jose, Calif.
Fresno, Calif.
Orlando, Fla.
Whittier, Calif.
Caldwell, Idaho
Maryland Heights, Mo.
Oklahoma City, Okla.
Phoenix, Arizona
World leader in scientific pest control
ORTHO

SINOX
SINOX GENERAL
SINOX PE
SINOX W

# DINITRO WEED KILLERS

## that signal, in all directions, fair weather for SALES!

**SINOX** — the original dinitro weed-killer — has gained widespread customer acceptance during the last seventeen years. In 4 special formulations, the SINOX label always means *additional* sales in *all* types of weed control. Stock up, *now!* Send for prices, marketing agreement, and other information.

**SINOX uses**

| *weed control:* | | |
|---|---|---|
| *selective* | SINOX | For safe selective weed control in onions, flax, and grain. |
| | SINOX W | For selective spraying of seedling alfalfa, onions, flax, and grain seeded to legumes. |
| *pre-emergence* | SINOX PE | For pre-emergence spraying of potatoes, beans, corn and peas; early summer treatment of alfalfa and clover. |
| *pre-harvest* | SINOX GENERAL | As a desiccant for Seed Alfalfa, Clovers, Sudan Grass, Milo, and Flax. Also used as a chemical weed mower in orchards, vineyards, ditches, etc. — Potato Vine Killing. |

### OTHER STANDARD AGRICULTURAL PRODUCTS

**HERBICIDES**

**STANTOX "64"**—2,4-D Amine Salt
**STANTOX "P-44"**—2,4-D Ester
**STANTOX "P-70"**—Low Volatile 2,4-D Ester
**STANTOX BRUSH KILLER**
Low Volatile Esters of 2,4-D, & 2,4,5-T
**STANTOX "LV-45"**—Low Volatile 2,4,5-T Ester
**STANTOX "SODIUM TCA"**—(90%)
**STANTOX MCP**
**STANTOX IPC**
**STANTOX CHLORO IPC**

**DORMANT FRUIT SPRAYS**

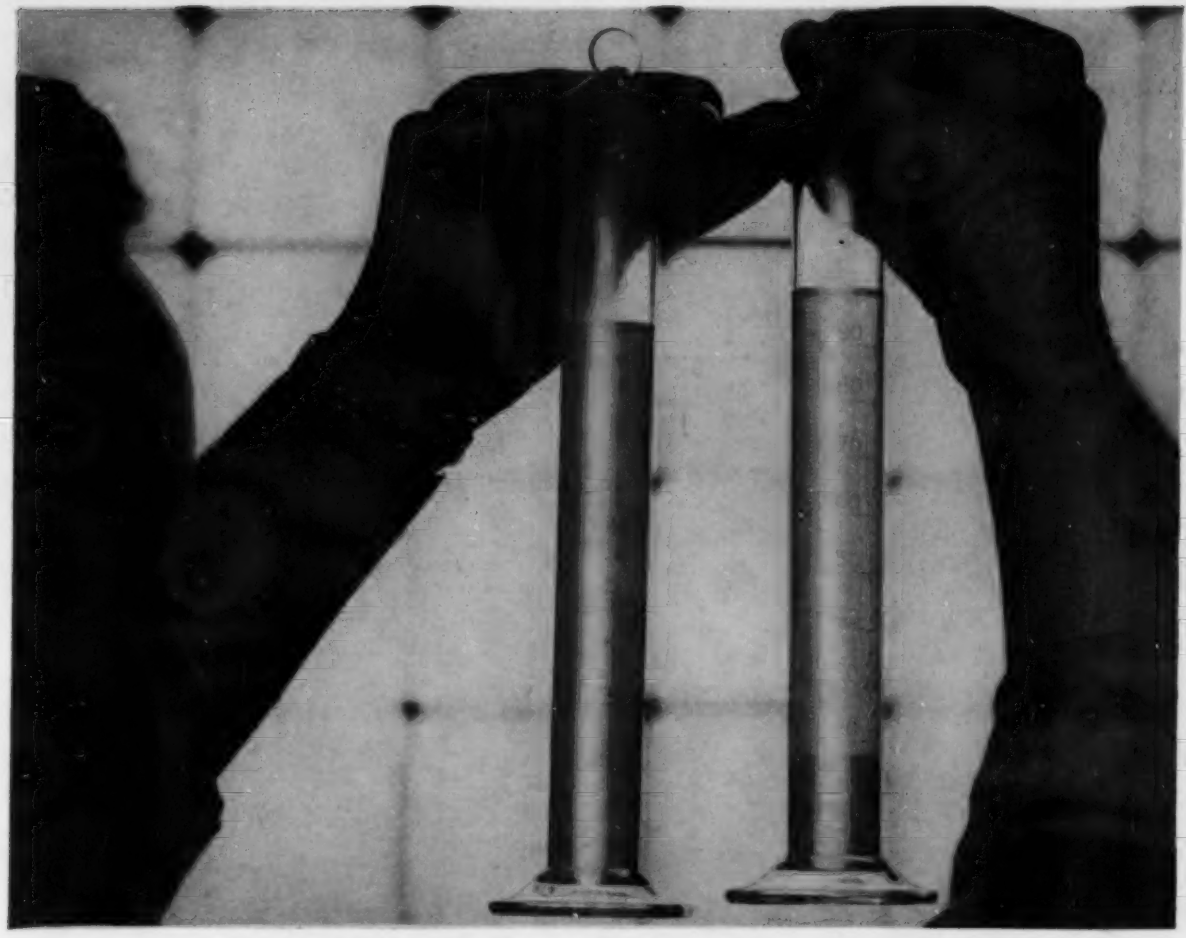
**ELGETOL**
**ELGETOL "30"**
**ELGETOL "318"**

**INSECTICIDES**

**STANPHOS "50"**
**TOXAPHENE EMULSION**
**DDT EMULSION**
**PARATHION EMULSION**
**PARATHION WETTABLE POWDER**
**STANICIDE AND OTHERS.**

## Standard Agricultural Chemicals, Inc.

**1301 Jefferson St., Hoboken, N. J. • 429 Forum Building, Sacramento, Calif.**



# Prove to Yourself the 3 Advantages of TRITON X-151 and TRITON X-171

**• Storage Stability • Performance • Simplified Operations**

Emulsifiable concentrates with excellent *storage* stability and performance are made with TRITON X-151 or TRITON X-171.

Check the important advantages you get by using these TRITON emulsifiers in your agricultural formulations:

**Stability during long storage**—accelerated storage tests made in our laboratories, and by many of our customers show that TRITON X-151 and TRITON X-171 outperform other emulsifiers in resistance to breakdown during long storage of concentrates. This points out just one of the many facts which help explain their fast-growing acceptance: Ether-type emulsifiers, such as the TRITON emulsifiers, are more stable than ester-type products under the varied conditions of storage encountered in the field.

**Performance**—field and laboratory results show uniformly good performance of emulsifiable concentrates using TRITON X-151 and TRITON X-171 alone or in conjunction with each other. These two TRITON emulsifiers offer outstanding spontaneity and stability to pesticide emulsions. Their versatility enables them to handle a wide variety of toxicant-solvent systems in waters of varying hardness.

**Simplified Operations**—TRITON X-151 and TRITON X-171 alone will handle practically *all* your emulsification problems. There is no need to purchase and store an assortment of emulsifiers . . . and with TRITON X-151 or X-171 in your formulations, your spring rush schedules need not be upset by reworking of faulty concentrates left in storage as carry-over from a previous season.

*TRITON is a trademark, Reg. U.S. Pat. Off. and in principal foreign countries.*

***Write us for further information or contact our field office nearest you.***

222 N. Michigan Ave.
Chicago 1, Ill.

5657 Wilshire Boulevard
Los Angeles 36, California

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San Francisco 5, California

216 Finance Building
1009 Baltimore Ave.
Kansas City 5, Missouri

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West Hill, Ontario, Canada

CHEMICALS FOR INDUSTRY

**ROHM & HAAS COMPANY**

**WASHINGTON SQUARE, PHILADELPHIA 5, PA.**

*Representatives in principal foreign countries*

DIAMOND ALKALI CHEMICALS

# Diamond Chemicals

## Insecticide formulators choose DIAMOND DDT·LINDANE·BHC for dependable potency

Formulators have come to depend on DIAMOND agricultural chemicals and one reason is the building pictured below. It's DIAMOND's research and development center, where the search for new and better insecticides is continually being pushed forward.

At other laboratories, located right at each DIAMOND plant, we check on every production step. This dependable *Quality Control System* is another reason for the uniform high quality of DIAMOND agricultural chemicals.

Write for helpful literature on any of our products, and feel free to use our technical consulting service for your special problems. Your inquiries are welcome. DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.

**DIAMOND INSECTICIDES**

- DDT—Technical
- BHC—High Gamma and 14% Technical
- LINDANE—100% Gamma Isomer
- K-101 (Ovex) Acaricide
- Hexachlorobenzene Seed Disinfectant

Wettable powders; dust concentrates; and emulsifiable and oil solutions of our technical grade chemicals.

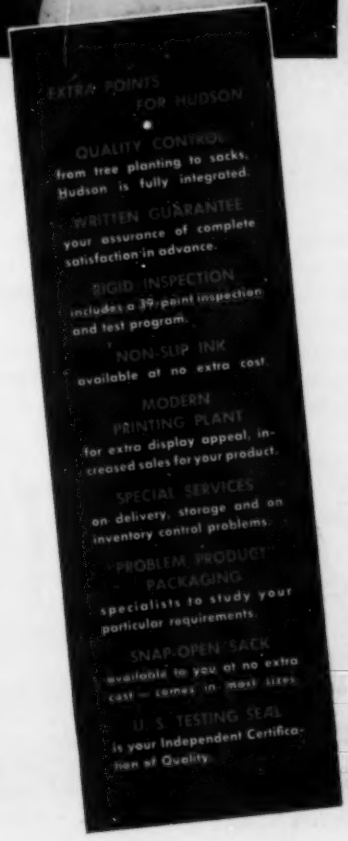
## *Enough to make the difference...*

# ANOTHER HUDSON MULTIWALL FIRST!

*Photo left: Actual light tracing photo shows how knife blade or pull and tug method of opening wastes time and product.*

*Photo right: Snap motion opening – saves time and product.*

**Snap-Open®**
**MULTIWALL**
**SACKS...**


EXTRA POINTS
FOR HUDSON
QUALITY CONTROL
from tree planting to sacks, Hudson is fully integrated.
WRITTEN GUARANTEE
your assurance of complete satisfaction in advance.
RIGID INSPECTION
includes a 39-point inspection and test program.
NON-SLIP INK
available at no extra cost.
MODERN PRINTING PLANT
for extra display appeal, increased sales for your product.
SPECIAL SERVICES
on delivery, storage and on inventory control problems.
PROBLEM PRODUCT PACKAGING
specialists to study your particular requirements.
SNAP-OPEN SACK
available to you at no extra cost — comes in most sizes.
U. S. TESTING SEAL
is your Independent Certification of Quality.

## *Provide Speed, Ease, and Economy*

The pull and tug days of opening bags are over! Now you can offer your customers the Hudson Snap-Open Multiwall bag... the one bag that opens the fastest, easiest... with just a flick of the wrist... the one bag that guarantees full measure of its contents no matter how fast it's opened.

Engineered by Hudson to meet the demands of the farmer and processor alike, the Snap-Open Sack outperforms conventional opening bags in actual tests... without a trace of spilling. Here is the answer to speed, ease, and savings... with the built-in feature of flow control.

Dealers everywhere are asking for the new Hudson Snap-Open Sacks. Be among the first packaging your product in this newest bag. Allocations for this sensational selling multiwall are being received now. Available in most sizes, call your Hudson representative today, or write Dept. AC4.

**Hudson Pulp & Paper Corp., Dept. AC4, 477 Madison Ave., New York 22, N. Y.**

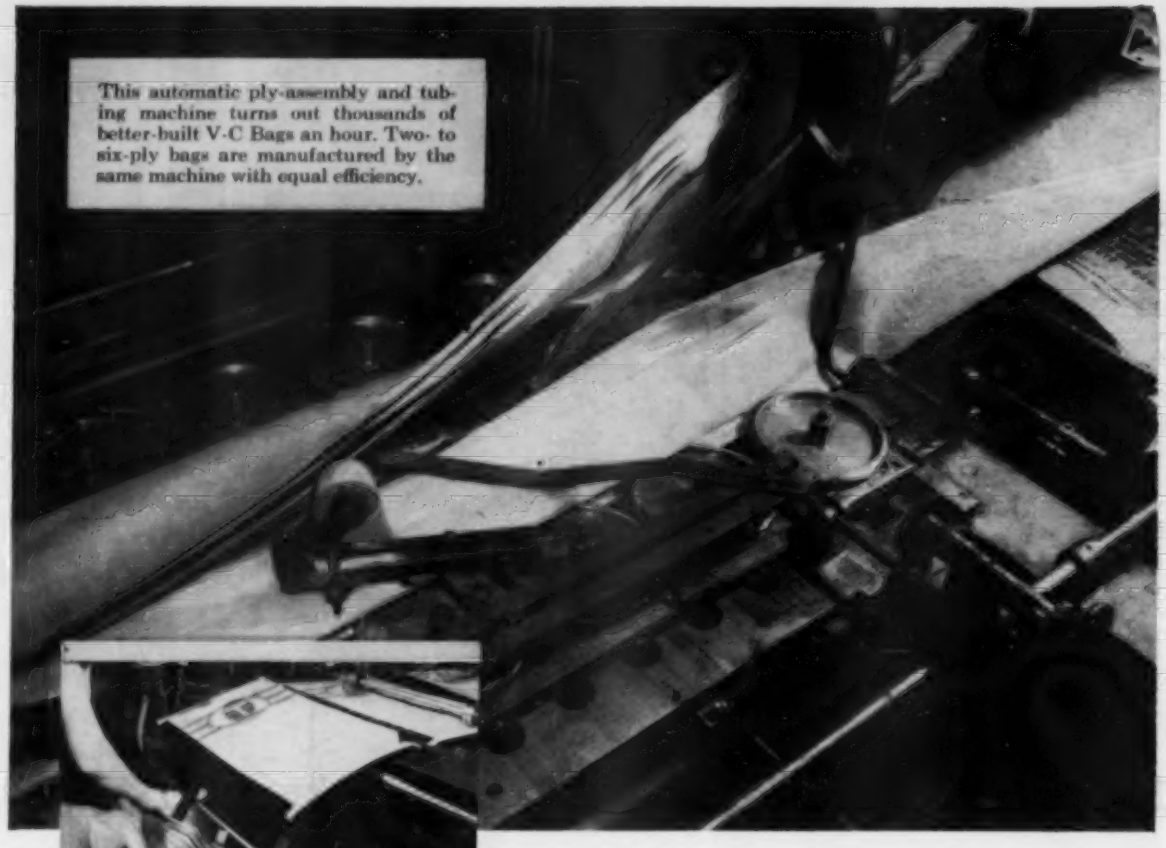
***YES... send us information on your Snap-Open Sack and its sales building opportunities.***

**Name** _____ **Title** _____

**Company** _____

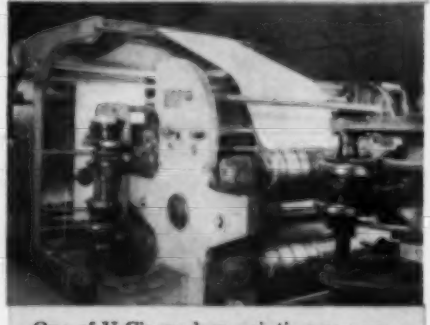
**Address** _____

**City** _____ **Zone** _____ **State** _____



This automatic ply-assembly and tubing machine turns out thousands of better-built V-C Bags an hour. Two- to six-ply bags are manufactured by the same machine with equal efficiency.

After ply-assembly, tubing and cutting, comes top and bottom sewing. Operator above is inspecting finished sewn-bags as they come from sewing machine.



One of V-C's modern printing presses. Capable of printing from one to four colors, V-C presses help put "sell" in your bags and faithfully reproduce your trade design.

# V-C's Modern Equipment Means Better Bags for You

**The most modern** methods, materials and machines are used in manufacturing V-C Multiwall Bags. This means you get the advantages of the latest developments in bag-making—some of which have been pioneered by V-C. Write for full information about V-C Bags, or discuss your requirements with a V-C representative. It will pay you to get V-C's free technical assistance.

VC® BAGS

MADE AS CAREFULLY AS YOUR BEST TAILORED SUIT

**Virginia-Carolina Chemical Corporation**

**BAG DIVISION:** 9th and Perry Streets, Richmond 5, Virginia

**DISTRICT SALES OFFICES:** Atlanta, Ga. • Wilmington, N. C. • New York, N. Y. • E. St. Louis, Ill. • Cincinnati, Ohio

# INDUSTRY News

## Mickels to CSC Sales Force

Ray F. Mickels recently joined the agricultural chemicals sales department of Commercial Solvents Corp., New York, as sales representative and distributor of ammonium nitrate in the mid-west. Mr. Mickels, who has served in other departments of CSC since 1951, will make his headquarters in Aurora, Ill.

## Stauffer Names Powell

A. M. Powell was named assistant production manager in charge of Eastern sulfur and insecticide plants in an announcement last month by Stauffer Chemical Co., New York. Mr. Powell, with headquarters at Chauncey, N. Y., will be responsible for agricultural chemical production in New Jersey, Missouri, Arkansas, Texas, Louisiana and Florida.

## Shell Moves Ag Sales Force

Shell Chemical Corporation's Agricultural Chemicals Division will move its headquarters to New York City from Denver, Colorado, around May 15, L. V. Steck, vice president in charge of marketing, announced March 21. The Division is the sales organization for the corporation's insecticides—aldrin, dieldrin and endrin —and the soil fumigants—D-D[R] and Nemagon.

While the plant for the manufacture of the insecticides will remain in Denver, the sales division, under direction of F. W. Hatch, will be located at 460 Park Avenue.

District sales offices in Atlanta; Jackson, Miss.; Houston; New York; San Francisco and St. Louis will continue to operate under the Division.

## New Formulator's Assoc.

A meeting of the new Carolinas-Virginia Pesticide Formulators Association will be held at Pinehurst, N. C., May 3 and 4. The group was formally organized, and constitution and by-laws adopted, at a meeting in Raleigh on the campus of North Carolina State College in January.

President of the new Formulators groups is W. R. Peele of W. R. Peele & Co., Clayton, N. C. William Crown of Carolina Chemicals, W. Columbia, S. C., is first vice-president and Myron Maxwell of Maxwell Insecticide Co., Cary, N.C., is second vice-president. Secretary-treasurer of the organization is J. B. Maddrey, Planters Chemical Co., Norfolk, Va.

## Diamond Black Leaf Organizes

The entire sales organization of the Diamond Black Leaf Co. met in St. Louis at the Chase Hotel on March 10th and 11th, immediately following the spring NAC meeting.

The Diamond Black Leaf Co. was formerly the Black Leaf Products Division of V-C Chemical Corp., the new organization being formed by Diamond Alkali Company and V-C Chemical Corporation on March 1.

## New Fert. Plant for N. Y.

Construction of a modern fertilizer plant at Big Flats, N. Y. has been started by Fertilizer Engineering and Equipment Co., Green Bay, Wis. for GLF Soil Building Service, N. Y.

## Pennsalt Appoints VP

Pennsylvania Salt Manufacturing Co. of Washington, Tacoma, Wash., recently named Errol H. Karr vice-president. Mr. Karr, has been with Pennsalt for twenty years. His last position was that of manager of technical development. Previously he had been chief chemist, plant superintendent at Portland, technical supervisor and manager of agricultural chemicals.

## Co-op Sales Up 33 Percent

A new fertilizer plant helped the Farmers Cooperative Oil Co., Nebraska City, Neb., to increase sales by 33 per cent during 1954. At its recent annual meeting the co-op distributed $418,000 in savings, half in cash and half deferred to reduce debt on the new anhydrous ammonia storage plant. N. Madison was elected president; Merlyn Osborn, vice president and John M. Brusk, Jr., secretary-treasurer.

## Wilkerson Diamond Texas Mgr.

Appointment of Martin F. Wilkerson as manager of the Houston branch sales office of Diamond Alkali Co., was announced recently. Mr. Wilkerson succeeds John W. Kennady, who became general manager of the Diamond Black Leaf Co., Richmond, Va., a firm organized jointly by Diamond Alkali Company and Virginia - Carolina Chemical Corp. to take over the manufacture and merchandising of the Black Leaf brand of agricultural chemicals and pest control products.

(L. to R.) K. D. Lozier, J. F. Corkill and G. J. Buerman.

## Pacific Borax Sales Conf.

The bulk sales department of the Pacific Coast Borax Co., Division of Borax Consolidated, Ltd., recently completed its annual sales conference. Approximately sixty men including representatives of the Agricultural Sales Division, Industrial and Plant Food Divisions attended this meeting which lasted a week at Furnace Creek Inn in Death Valley, California. General chairman of the conference was Mr. J. F. Corkill, vice president, bulk sales. Guest speakers included Mr. G. J. Buerman, director of purchases, Ferro Corporation of Cleveland, Ohio and Mr. K. D. Lozier, vice president, St. Regis Paper Co., New York.

## Frontier Names Sales Rep.

Harry E. Baldridge has been names sales representative of the Frontier Chemical Co., division of Union Chemical and Materials Corp., Wichita, Kansas, for the territory covering Kansas, Oklahoma, Arkansas and Louisiana. Mr. Baldridge joined the Frontier organization in August, 1952 as chief chemist of the Wichita plant.

•

## Hold California Ag. Forum

Problems of current concern to central California growers were reviewed at a forum held March 15 at Bakersfield, Calif. Under the joint chairmanship of Vernon E. Burton and John R. Fisher the forum discussed cotton irrigation and fertilization, weed control, the potato tuber moth and the yellow clover aphid.

1955 officers are: J. T. Vedder, Bakersfield, president; Les Stromberg, Fresno, vice-president; David N. Wright, Bakersfield, secretary; and George A. Meyer, Fresno, treasurer.

"The Use of Commercial Fertilizers on Cotton" was reviewed by Marvin Hoover, University of California Extension Service. W. A. Harvey, University of California, Davis; John Miller, University of California, Shafter; Chester L. Fory, University of California, Shafter; and Paul Baranak, Madera County, held a round table discussion on weed control. Among the interesting papers presented on this panel was a report on new herbicides by Mr. Harvey.

## White Fringed Beetle in N. J.

The white fringed beetle has been found in a small area in Vineland, N. J., infesting two or three small farms. The infestation has been estimated as about 3 years old, and probably brought in on some plant product.

Drs. F. A. Soraci, State Agriculture Department, and B. B. Pepper, N. J. Agricultural Experiment Station report that dieldrin will be used to wipe out the infestation completely. The insecticide will be applied in granular form by aeroplane, using about 5 lbs/acre; and as a liquid in surface application. Treatment is already underway.

Dr. Pepper will run three surveys during the summer to determine the value of control measures. One will compare crop samples from nearby untreated farm areas with the yield in the sprayed land to evaluate effect on quantity; another will compare quality and a third will rate the operation's effects on other pests.

•

## Phelps Dodge Names Bennett

Walter C. Bennett, president of Phelps Dodge Refining Corp., New York, since 1935, recently was named chairman of the board of directors, and Carleton S. Harloff, executive vice president, was elected president. Mr. Bennett will continue as chief executive officer, under whom Mr. Harloff will be executive officer in charge of operations of the corporation.

## Shell Reports on Endrin Stability

Stable endrin dusts were satisfactorily prepared on a commercial basis during 1954, according to a recent report by Shell Chemical Co., Denver. Formulators are advised that dusts and wettable powders with good stability are prepared by using inert, nonactive carriers, or by deactivation of active carriers with HMT (hexamethylenetetramine).

•

## Stauffer Service Program

A new educational and technical service program for agricultural experimental agencies, fertilizer distributors and processors was announced recently by Stauffer Chemical Co. and by Wilson & Geo. Meyer & Co., distributor for Stauffer phosphate and ammoniated phosphate products. Russell M. White has been named to head this service which will develop new uses for fertilizer products through research and experimental work.

•

## 1st Meeting of N. Assn.

Discussions of soil fertility, nitrogen solution compatibility, and nitrogen storage and handling highlighted the first meeting of the National Nitrogen Solution Dealers Association held March 14-15th at the Paxton Hotel, Omaha, Neb. Association president, Wayne Johnson, presided at the opening sessions, and introduced W. Colvin, Allied Chemical & Dye Corp., who discussed "Advertising, Merchandising & Promotion of Nitrogen Solutions." The question of financing fertilizer programs was reviewed by M. Murray, Chillicothe State Bank, Chillicothe, Mo., while further observations on developing dealer outlets were made by H. Lathrope, Allied Chemical & Dye Corp.

The technical and practical aspects of nitrogen application in agronomical practices were presented in the following reports: "Nitrogen Solution Compatibility with Insecticides and Weed Killers" by M. Lowish, Shell Chemical Corp.; "Soil Testing for a Balanced Food Program," W. Ringler, University of Nebraska; "Physical, Chemical and Agronomical Characteristics of Nitrogen Ferti-

lizer Materials," Proctor Gull, Spencer Chemical Co.; "Solving Problems of Storage, Transportation and Application of Solutions" W. Arnold, Allied Chemical Corp.; and "Soil Fertility and Balanced Farming," J. Falloon, University of Missouri.

Commercial exhibits were directed by W. Abel, Tarkio, Mo., while J. White, Auburn, Neb., was chairman of the business session. Merrill Langfitt was program chairman.

•

## W.A.C.A. To Meet June 21

The Western Agricultural Chemicals Association has scheduled a meeting at the Hotel Clark in Los Angeles for June 21, the day before the opening of the annual meeting of the Pacific Slope Branch of the Entomological Society of America scheduled for Mission Inn, Riverside, California June 22-24.

C. O. Barnard, Secretary of W.A.C.A. advises that membership in the association is up 40% since the first of the year. There are now approximately 250 members in class A which includes producers of basic agricultural chemicals doing an interstate business, 150 members in class B which includes producers of basic agricultural chemicals doing an intrastate business or processors or formulators doing an interstate business, 100 members in class C which is restricted to formulators doing business intrastate in a local area, and 50 affiliate members, suppliers of containers, emulsifiers, solvents and diluents.

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## $NH_3$ Shipped by Water

Phillips Chemical Co. recently commenced shipment of anhydrous ammonia by barge from its Adams Terminal facilities at Houston, Texas. First cargo was 800 tons of ammonia destined for Mid-South Chemical Co., President's Island, near Memphis, Tenn.

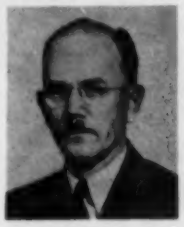
•

## Mich. Chem. Reports Loss

Michigan Chemical Corp., St. Louis, Mich., in its annual statement to stock holders for 1954 reports a net loss amounting to $0.43 a share after tax carry-back, against $0.26 loss a share in 1953.

## Nelson, ESA Exec-Sec.

Robert H. Nelson was recently appointed executive secretary of the Entomological Society of America (see story p. 89 March *Agricultural Chemicals*), succeeding Dr. A. B. Gurney who resigned earlier this year to return to his taxonomic studies in the U. S. Department of Agriculture.



Mr. Nelson is a graduate of the University of Nebraska, with advanced studies at Iowa State College and the Ohio State University. He has been with the U. S. Department of Agriculture since 1931.

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## Moncrieff Dies in Car Skid

Lawrence Moncrieff, salesman for Riverdale Chemical Co., Harvey, Ill. was killed last month when his car overturned after skidding on icy pavement near Mason City, Iowa. Mr. Moncrieff was 28 years old. He leaves a wife and two children, ages 1 and 2.

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## NJ Mosquitos Resistant to DDT

Increasing reports of mosquito resistance to insecticides have caused concern to control agencies throughout the United States and in many foreign countries. Such areas as Florida, California and the Tennessee Valley have been the principal locations of this trouble. Now, however, it appears to have reached New Jersey.

Speaking March 11th at the 42nd annual meeting of the N. J. Mosquito Extermination Association at Hotel Haddon Hall, Atlantic City, Paul P. Burbutis and James R. Davis of the N. J. State Agricultural Experiment Station, reported discovery of a colony of house mosquitos (*culex pipiens*) which are 15 times as resistant to DDT as are ordinary mosquitoes. They were found in a flooded cellar in Hoboken where DDT has been used the last 5 years.

Search for resistant mosquitoes was stimulated by conflicting reports of the effectiveness of DDT in the Hackensack Valley the past two years. Mosquito-control workers have been watching for the appearance of resistant mosquitoes in New Jersey but this is the first authentic report. The first discovery of resistant housflies was made by a N. J. Experiment Station scientist in a Hunterdon County dairy barn in 1948.

A report on 5 years of aircraft spraying for mosquito control in seashore counties was given by Daniel M. Jobbins, of Rutgers University. Dr. Jobbins reported generally good results in reducing salt marsh *Aedes* mosquito populations with DDT sprays, which last year were applied at a cost of a little over 18 cents per acre, a figure somewhat lower than the 21-cent cost of the first years. Dr. Jobbins does not believe however that this spray program will encourage the development of DDT-resistant mosquitoes.

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## Borax Co. Personnel Changes

Borax Consolidated, Ltd., New York, recently announced three personnel changes in its Pacific Coast Borax Co. division. L. L. Fusby was appointed production manager with headquarters in the Los Angeles office, W. J. Diffley was named superintendent of boron operations; and D. S. Taylor was advanced to director of industrial research.

•

## USDA Names Noyes

The U. S. Department of Agriculture announced recently the temporary appointment of Clyde C. Noyes of Lincoln, Neb., to the Federal Extension Service, to work on an educational program on grain sanitation. Mr. Norris will be on leave from the University of Nebraska, where he has been state leader of extension programs.

•

## New Nitrogen Plant in Canada

A $20 million nitrogen fertilizer plant is reportedly projected for Southern Alberta-Canada by a British-American combination consisting of Commercial Solvents Corp., New York, and British Dominion Oil Co., Calgary. The plant is expected to be completed during 1955. The bulk of its produce will go to the prairie provinces of Canada.

# SYSTOX*

*now nationally accepted for control of aphids and mites on*

**COTTON**

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# Canners Discuss Residues at Chicago Convention

H. H. Slawson

PESTICIDE residues on canning crops and their effect on canning plant procedures was the subject of an animated symposium during the 48th annual convention of the National Canners Association in Chicago, Feb. 16-23.

Pest control is a dynamic business and exceptional weapons are available for effective programs, Dr. Chas. E. Palm, Cornell Univ., Ithaca, N. Y., declared in a paper on "How Pesticide Tolerances May Affect Procurement of Raw Products." (*Agricultural Chemicals*, March, p. 81.)

The Miller Act, he said, provides definite guidance on pesticide residues and, under its provisions, effective pest control programs can be conducted within the tolerance limits.

The alarming buildup of mite populations, especially in California, presents a serious problem to food processors, in their efforts to avoid product contamination from pesticide residues, Dr. W. M. Hoskins, Univ. of California, Berkeley, observed.

The mites have shown resistance to some hitherto effective chemicals, he said. There are several dozen acaricides on the market but all involve residue problems. Chemical methods for their analysis are troublesome or lacking. Flies are not sensitive to most of them. Work is however, being done, Dr. Hoskins said, to develop a direct bioassay method, using mites or certain aquatic crustacea in place of flies. No progress has been made as yet, he stated.

In his paper on "Purification of Plant Materials and Separation of Insecticides for Bioassay." Dr. Hoskins described the use of the "small vial method" for residue analysis with houseflies as the test insect.

Dr. F. C. Lamb of the Canners' Association's western branch laboratory at Berkeley, paid tribute to the work of Dr. Hoskins and his associates in developing the bioassay technique. This method was not, however, designed for routine analyses of large numbers of samples, he said, where speed and simplicity of operation are prime requisites and high degree of accuracy and sensitivity may not be required.

Further work of the Canners' Association's research laboratory at Washington, D. C., for determining insecticide residues in processed foods was described in a paper jointly authored by C. J. Tressler and T. H. Jenkins. Reporting that the techniques of the housefly bioassay method for insecticide residues have been brought to a workable point, and that maintenance of a fly colony is not too difficult, they said, studies were begun to apply the method under practical operating conditions and to determine its value as a routine quality control method.

"A study of results indicates that overall estimation of toxicity in a food by bioassay is fairly accurate. Accuracy, as measured by per cent of recovery of DDT and malathion added to unprocessed spinach was less by bioassay than by chemical methods. After processing, the situation for DDT was about the same but for malathion the chemical method could not be relied on to detect residues quite toxic to flies.

Flavor changes in canned foods due to use of pesticides on the growing crops were discussed by Dr. Elly Hinreiner, Univ. of California, Davis, Calif. The problem of determining which of the newer type organic insecticides are apt to cause flavor changes, he said, is extremely complex. Many factors are involved and it is, he said, "a hopeless task" to test all factors experimentally.

Dr. Hinreiner presented a detailed report of such flavor information as is available for BHC, lindane, DDT, aldrin, dieldrin, chlordane, heptachlor, toxaphene, various sulfonates, malathion and many other compounds, also on some systemic pesticides on which investigations have been started only recently.

### Shell Opens Ohio Sales Office

A new sales office has been established by the Agricultural Chemicals Division of Shell Chemical Corp. in Columbus, Ohio, for sales and marketing of aldrin, dieldrin and endrin. Under the direction of S. J. Hastings, district manager in New York, the office will be headed by J. H. Hawke with C. J. Green as technical salesman. It will serve as headquarters for representatives in Ohio, Kentucky, Michigan and West Virginia.

•

### Back Joins Carbide Corp.

Richard C. Back has joined Carbide and Carbon Chemicals Co., New York, as entomologist for the agricultural chemicals development group. Dr. Back's activities will be concerned primarily with Crag fly repellent and insecticidal chemicals.

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### Crowley Ups Solvent Output

Doubled production and five per cent decrease in bulk prices for its No. 150 xylol-type solvent were announced recently by Crowley Tar Products, Inc., New York.

No. 150 xylol-type solvent consists of xylene refined to the point where a sufficiently low phytotoxicy is attained to prevent incidental burning of foliage when used in insecticide formulations.

•

### CACA Elects Cherry Pres.

The Colorado Agricultural Chemicals Association elected Fred Cherry president and Ralph Farr vice president at its recent annual meeting in Denver, Colo. Mr. Cherry is a district representative of Rohm & Haas Co., Philadelphia, and Mr. Farr is with the Farr Co., Greeley, Colo. Two new directors, elected for two year terms, are E. C. Stone, E. C. Stone Co., and Robert Bowman, General Chemical Co.

Following reports of the various committees, the meeting featured a joint session with the State Department of Agriculture and personnel from Colorado A. & M. College, the latter representing the Colorado Agriculture Chemicals Clearing Committees.

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## Velsicol Appoints Sales Mgr.

The appointment of G. H. Weldon as manager of insecticides sales in the western division was announced recently by Velsicol Corp., Chicago. Mr. Weldon has been with Velsicol since 1949 as regional sales representative in the west.

•

## V-C Control for Nematodes

Virginia Carolina Chemical Co., Richmond, Va., has developed a nematocide which is reported to control the pests without destroying the plants. The compound, 0-2,4-dichlorophenyl- 0, 0-diethyl phosphorothioate (V-C 13 Nemacide) is already registered in Virginia and Florida for use on turf and ornamental plantings, and the manufacturer is now waiting Food & Drug approval for use on citrus and truck crops.

In field tests on golf greens, applications of 125-250 lbs/acre have been effective. The compound is available as a 75 per cent emulsifiable concentrate.

•

## Ex-Mathieson Exec. Dies

Robert J. Quinn, chemical engineer and former sales executive of Mathieson Chemical Corp., now Olin Mathieson Chemical Corp., died last month in Tucson, Arizona, after an extended illness. He was 65 years old and had been living in retirement at Tucson since 1953. He served Mathieson from 1923 to 1945.

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## Chem. Assoc. Names Officers

The Commercial Chemical Development Association reported last month election of officers for the year beginning July 1, 1955. F. S. Swackhamer, Shell Chemical Corp., was named vice president for 1955 and president-elect for 1956.

R. L. Bateman, Carbide and Carbon Chemicals Corp., New York, who is completing a term as vice president this year, will serve as president for the coming term. He succeeds Nolan B. Sommer, American Cyanamid Co. J. M. Rogers, Minnesota Mining and Manufacturing Co., Minneapolis, and J. R. Dudley, Carwin Chemical Co., were re-elected treasurer and executive secretary, repectively.

•

## Stauffer to Build Annex

Stauffer Chemical Co., New York, announced recently that it will build a 12,800 square foot addition to its insecticide factory in Tampa, Fla. Construction contract has been awarded to the Luria-Engineering Co., Bethlehem, Pa.

## Iowa Group Names Officers

Wood W. Weaver, Iowa Falls, Ia., was elected president of the Iowa Agricultural Limestone Association at the organization's annual convention in Des Moines. Roy A. Potthoff, Des Moines, was named vice-president. Elected to three-year terms on the board of directors were K. K. Kinsey, Cedar Rapids; Walter A. Schemmer, Logan; and Ben Ravitz, Ottumwa. Mr. Weaver will fill out an unexpired one-year term.


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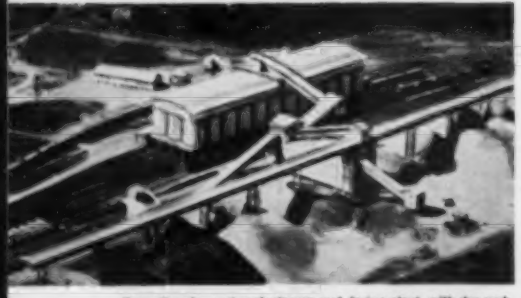

From the air—wet rock storage and drying plant, with dry rock storage silos in background. These silos, 29 in number, have a total capacity of 40,000 tons of dried rock. Under the silos are four runways where 40 railroad cars can be loaded at a time.

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# Nematology Workshop in N. Y.

A NEMATOLOGY Workshop was held at the United States Dept. of Agriculture's Golden Nematode Control Headquarters in Hicksville, Long Island, New York February 14-25, 1955 under the direction of Joseph F. Spears, project leader. This training course dealing with plant parasitic nematodes was sponsored by the Nematode Control Project of the Plant Pest Control Branch, Agricultural Research Service and brought together some 40 federal and state employees in the New York area concerned with nematode regulatory problems.

The principal subject matter covered in this training course included laboratory techniques used in the preparation of microscopic mounts and the means of isolating nematodes from bulbs, plant tissues and soil. These studies included anatomy, morphology and life cycles, and considerable time was devoted to nematode systematics. However, since the personnel who attended this course were employees directly concerned with nematode regulatory problems, particular emphasis was placed on those groups of nematodes with species which have received special surveys or attention from a regulatory viewpoint. Extra time was taken to study the genus *Heterodera* with such important species as *rostochiensis, tabacum, schachtii,* and *glycines.* Another laboratory exercise familiarized employees with the genus *Ditylenchus* containing the important species *destructor* and *dipsaci.* A full period was used to acquaint personnel with the nematode *Radopholus similis,* a potential threat to the citrus industry. Additional time was allocated to either known or suspected agricultural pests such as species of *Meloidogyne, Belonolaimus, Trichodorus, Tylenchorhynchus, Pratylenchus* and *Xiphinema.*

Instructors for the course were: Mr. A. L. Taylor, Section of Nematology of the U. S. Dept. of Agriculture, and Dr. J. N. Sasser, North Carolina State College. They were assisted by Dr. Victor Dropkin, Mr. George Fassuliotis of the Nematology Section and Mr. Daniel O. Betz, Golden Nematode Control Project. Many of the personnel attending the course were directly concerned with potato problems, therefore, eight hours of instructions was set aside for lectures and demonstrations concerning the principal varieties of potatoes and the diseases and insects that affect them. This phase of the instruction was under the direction of Cornell University instructors: Dr. Robert Dickey, Dr. Richard Sawyer and Dr. Maurie Semel.

•

**To Represent Arizona Chem.**

Robert T. Schoepflin has been named midwest sales representative of the Arizona Chemical Co., a joint subsidiary of American Cyanamid Co., New York, and International Paper Co., New York. With headquarters in Chicago, Mr. Schoepflin will service industrial users of sulfate turpentines and the "Acintol" line of tall oil derivatives. These products are used in the insecticide, paint, detergent and mining industries.

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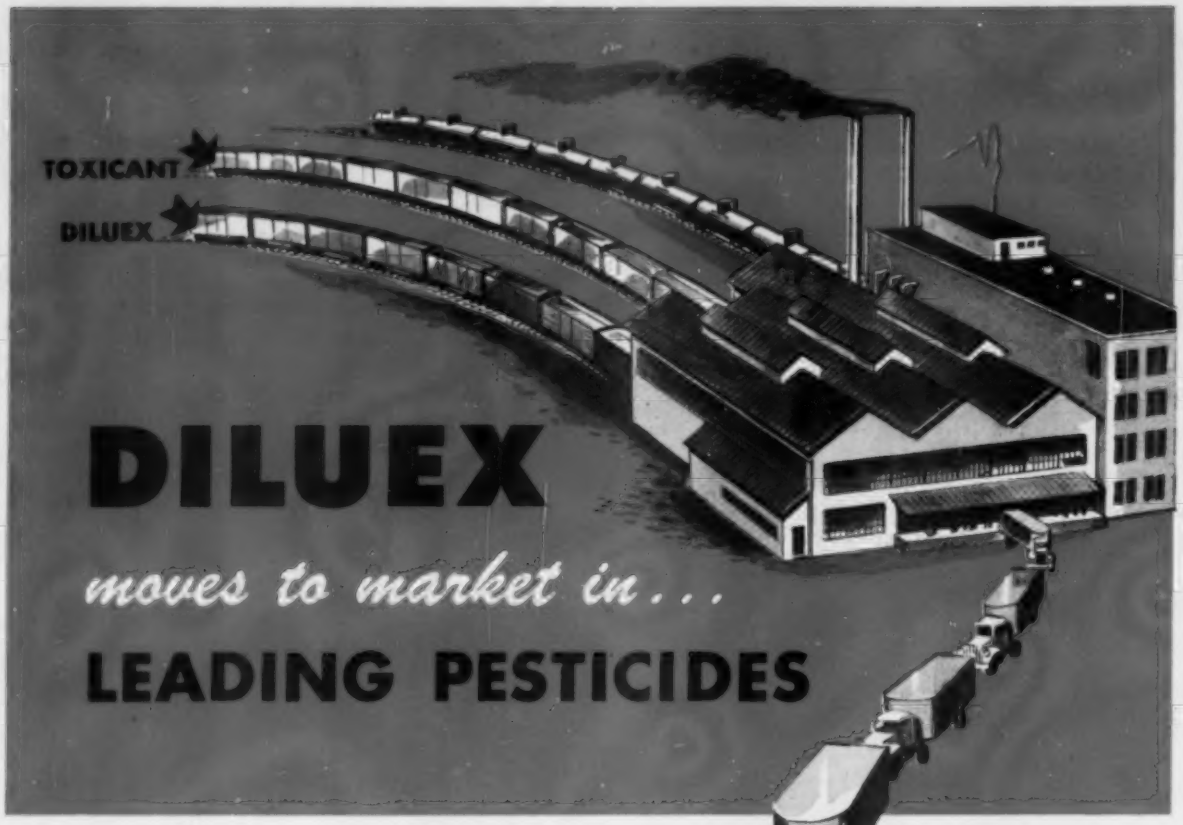

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Are you milling DDT, BHC, or other organics?

Formulating blended dusts?

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As grinding aids, adsorbent concentrate bases, and dust conditioners for the most exacting uses of the industry, Floridin products have won a leading place. The demand for DILUEX and DILUEX-A, increasing steadily for many years, has recently grown to multiplied tonnage. Production facilities have been enlarged accordingly, and shipments are being made without delay, by train and truck from two Floridin plants at Quincy and Jamieson, Florida. Correspondence is invited.

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# New Pesticides, Herbicides Appraised As ACS Meets in Cincinnati

PESTICIDE toxicity, experiments with new chemicals, and new uses for standard chemicals were the subjects most extensively reported at the pesticide sessions of the 127th national meeting of the American Chemical Society, Cincinnati, March 30 - April 2. Joseph F. Treon, Frank P. Cleveland and John Chappel discussed in considerable detail the toxicity of endrin; L. W. Hazleton reviewed toxicological studies on sulphenone; and W. L. Dove and H. O. Schroeder spoke on the possibilities of protection of stored grain with pyrethrins-piperonyl butoxide emulsion sprays.

Preceding the three pesticide meetings, held March 30-31, the Division of Chemical Literature and the Pesticide Subdivision held a joint symposium on "The Literature of Agricultural Chemicals." Panel members handled this topic with the needs of the agricultural industry in mind, as may be seen from titles of the individual reports: "Use of the Entomological Literature by the Agricultural Chemical Specialist," Francis A. Gunther and Louis A. Riehl; "The Literature of Plant Pathology Useful to Agricultural Chemicals Specialists," M. M. Baldwin and K. Starr Chester; "Economic and Marketing Information on Pesticides," Harold H. Shepard; and "The Literature of Pesticides Toxicology," Henry F. Smyth, Jr.

### Toxicity

The subject of toxicity was pursued further in a panel discussion of "Effects of Feeding Dieldrin- and Heptachlor-Treated Alfalfa Hay to Dairy Cows," by Joseph R. Harris, George E. Stoddard, George Q. Bateman, J. LeGrande Shupe, Delbert A. Greenwood, Lorin E. Harris, and Thomas L. Bahler, of the Utah Agricultural Experiment Station, Logan, Utah; and "Toxicity of Trinitrobenzene-Aniline-Complex, a Rodent Repellent," by R. W. Fogleman, J. R. Elsea, O. Paynter, and W. Kundzins, Hazleton Laboratories, Falls Church, Va.

Highlights of the morning meeting, March 31, were three papers covering new chemicals and new uses: "Insecticidal Phosphates Obtained by a New Rearrangement Reaction," W. F. Barthel, B. H. Alexander, P. A. Giang, and S. A. Hall, U.S.D.A., Beltsville, Md.; "Agricultural Applications and Soil Residue Studies of 3-Amino-1,2,4-Triazole," by Kenneth A. Sund, Fred M. Gordon and Bryant L. Walworth, American Cyanamid Co., Stamford, Conn.; and "O-O-dialkyl S-(alkylmercaptomethyl) dithiophosphates as Systemic Insecticides," by Elton L. Clark, G. A. Johnson and E. L. Mattson, American Cyanamid Co., Stamford, Conn.

The first of these reports indicated that dehydrochlorination of O,O-dialkyl 2,2,2-trichloro-1-hydroxyethyl phosphonates (with the first member of the series being the insecticide L 13/59) causes rearrangement to more volatile, highly insecticidal dialkyl 2,2-dichlorovinyl phosphates. The products of dehydrochlorination were compared with compounds of known structure obtained by another synthesis and found to be identical. Other isomeric structures including those presented by Mattson, Spillane, and Pearce (presented at 126th meeting of the ACS, 1954) were considered and ruled out by chemical and physical data and also by synthesis.

The authors went on to mention new compounds, several of which possess high insecticidal activity. Dehydrochlorination of O,O-diethyl 2,2-dichloro-1-hydroxyethyl phosphonate converted it to the systemic insecticide diethyl 2-chlorovinyl phosphate. The latter compound could also be prepared by the Perkow synthesis.

In their report on 3-amino-1,2,4-triazole, Messrs. Sund, Gordon and Walworth said that 3-amino-1,2,4-triazole is a new plant growth regulator with some unusual properties. It is absorbed by roots and aerial parts of plants and is translocated to the growing points.

The chemical shows promise as a herbicide because of the type and variety of plant species affected at low dosages. Commercial control of the following weeds appears possible: Johnson grass, nut grass, foxtail, quack grass, Canada thistle, and poison ivy. Interest has also been shown in aminotriazole as a cotton defoliant and second growth inhibitor, alone, and in combinations with other defoliants. Greenhouse experiments have demonstrated that wetting agents have increased the herbicidal efficiency on monocotyledonous plants.

The oxidation of octamethylpyrophosphoramide was reviewed in a report by Hiroshi Tsuyuki, John E. Casida, and Mark A. Stahmann, University of Wisconsin, Madison, Wis. The paper was based on an experiment in which the systemic insecticide, schradan, was chemically oxidized by hypochlorite, permanganate, bromine water and dichromate to a powerful anticholinesterase agent whose structure is octamethylpyrophosphoramide N-oxide 1. This product is identical to the biological metabolite of schradan.

W. E. Dove and H. O. Schroeder, Food Machinery and Chemical Corp., were scheduled to open the Friday session, with a talk on protection of stored grain with pyrethrins-piperonyl butoxide emulsion sprays. They compared the insecticidal efficiency of combinations of pyrethrins and piperonyl butoxide in powders, oil sprays and emulsions, which were applied as experimental treatments to stored grain for protection from insect damage. In a more comprehensive manner the efficiency of the usual oil-type pyrethrins-piperonyl butoxide emulsions was compared with oil-free emulsions.

Results were reported briefly upon the dilutions and dosages of oil-free emulsion sprays, the ratios of pyrethrins to piperonyl butoxide in the grain sprays, the use of butyl stearate and methyl myristate as diluents for

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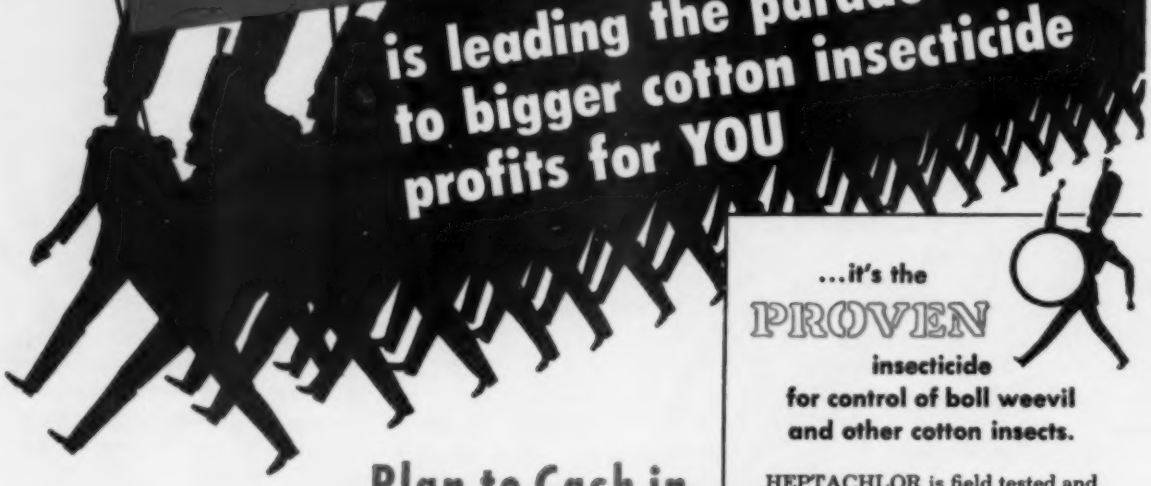

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the concentrates, the degree of coverage of the grain that ensures good control of insects and the effect of water as a carrier for the sprays of stored grains.

The development of oil-free sprays is another safe and effective step in the practical use of insecticide materials that are already well known for their unusual safety.

On the same program P. C. Hamm and A. J. Speziale, Monsanto Chemical Co., St. Louis, Mo., revealed that a new class of herbicides, N-substituted alpha-chloroacetamides, have been shown to possess outstanding effectiveness and selectivity, particularly for the control of annual grasses. Title of their paper was "Herbicidal Activity of N-Substituted alpha-chloracetamides." They correlated the herbicidal activity of the alpha-chloracetamides with respect to variations of the N-substituents and the acyl chain. This active group of pre-emergence, grass-specific compounds was discussed with respect to type of activity exhibited, herbicidal specificity, herbicidal power, relationship between structural configuration and activity and methods of preparation. Compounds of such diverse structures as the diethyl, diallyl, dipropyl, cyclohexyl, tetrahydrofurfuryl, chloroallyl and chloropropyl amides, the N-alkylanilides, and the morpholide and piperidide of chloroacetic acid have exhibited outstanding grass-specific phytotoxicity, according to the report.

L. W. Hazleton and Hobart O. Thomas were chairman and secretary, respectively, of the pesticides subdivision. Presiding over the three sessions were Joseph A. Noone, F. A. Gunther, and Wendell F. Phillips.

The panel on the literature of agricultural chemicals was under the direction of Richard L. Kenyon with the following participating: C. J. Willard, E. K. Alban, Francis A. Gunther, Louis A. Riehl, M. M. Baldwin, K. Starr Chester, Harold H. Shepard, F. Dallas Sparre and Henry F. Smyth, Jr.

About 5000 delegates attended the ACS meeting as a whole, which was under the general chairmanship of Joseph Treon. Included in the interesting events planned for conference members were trips to plants and laboratories located in Cincinnati.★★

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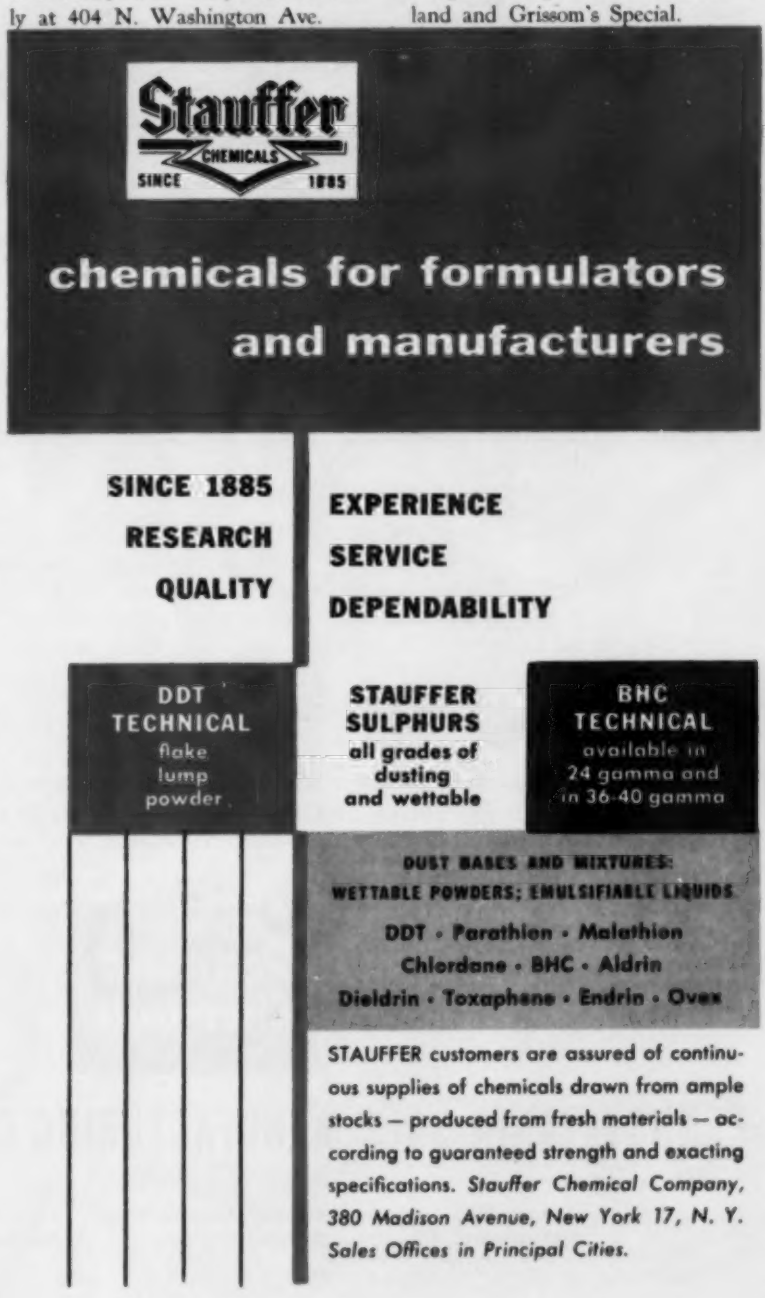
### Hypro Engineering Moves

Hypro Engineering, Inc., Minneapolis, Minn., manufacturers of roller and rubber impeller pumps, recently moved their offices and assembly area into new quarters at 700 39th Ave., N. E. They were formerly at 404 N. Washington Ave.

### Phillips Has Nursery

Phillips Petroleum Co. has reported establishment of a nursery for grass and legume study at its agricultural project near Foraker, Okla. Plant specimens will be observed in connection with response to nitrogen and other plant foods, and adaptation to revegetation programs. Five species of bermuda grass have already been planted and, according to preliminary observations, varieties showing the greatest vigor are Greenfield, Midland and Grissom's Special.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## Sponsor Sanitation Seminar

A sanitation seminar has been arranged for April 14 at the Sheraton Hotel, Chicago, by Arwell, Inc., Waukeegan, Ill.

Among the reports to be presented at this meeting are: "Insecticides," Dr. George C. Decker, University of Illinois, Urbana; "Grain Sanitation Program," Howard C. Hunter, American Institute of Baking, Chicago; "Cereal and Granary Insects," William H. Schoenherr, Lauhoff Grain Co., Danville, Ill.; and "The Khapra Beetle," John D. Mock, Arwell, Inc.

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## Find No Dumping of Potash

The U. S. Government closed its anti-dumping investigation of potash imports from E. Germany with a decision by the Tariff Commission that imports were not injuring domestic producers. The decision came last month at the conclusion of public hearings, during which representatives for local potash producers and importers argued their respective cases. Final vote of the six man commission was three-to-three, which means that the commission failed to find that domestic producers were being injured.

As a result of the commission's findings, the treasury has instructed customs field officers to process entries of East German potash without regard to any question of dumping. Customs officials had been withholding appraisement of such merchandise until the case was settled.

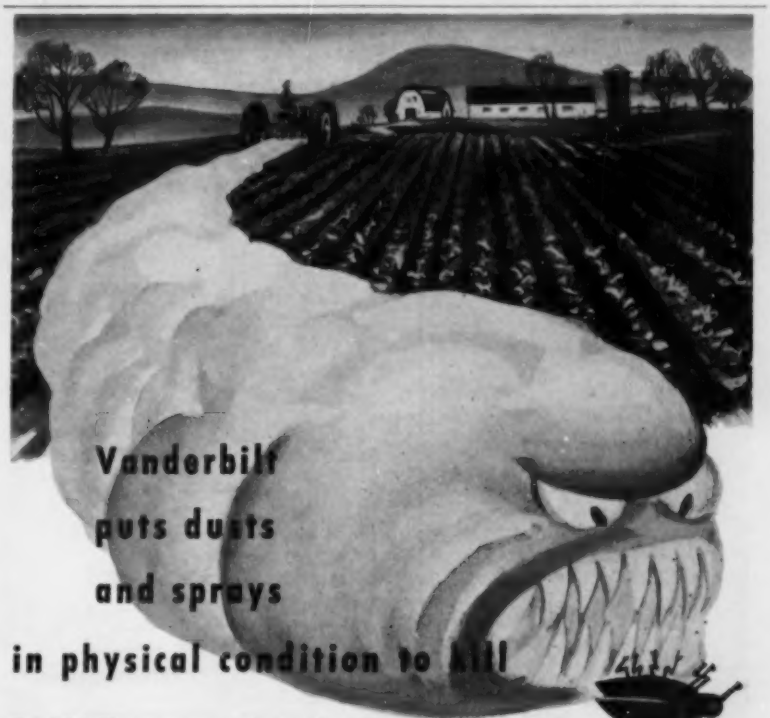
This was the first dumping case sent to the Tariff Commission under last year's amendment to the anti-dumping act of 1921. Under the law, the treasury must first find that the suspected commodity is being sold, or is likely to be sold, in this country at less than fair value, as defined by the anti-dumping act. When such a finding is made the case is sent to the Tariff Commission for public hearings and a final verdict. In the event of a decision against the importers, the treasury department may impose higher duties to equalize prices.

Two other investigations on potash imports are pending before the Tariff Commission, involving potash from West Germany and France. In both case the Treasury had determined that sales are being made in this country at less than fair value. A decision is expected shortly.

In the East German case, the three commission members who decided that domestic industry was not being injured, said that officials should continue to watch imports of muriate of potash from East Germany.

## Marietta Expansion in Md.

The Marietta Concrete Corp., Marietta, Ohio, builders of silos, have recently completed a $100,000 building addition to the Marietta branch plant in Baltimore, Md. This new addition provides an increased work area of 10,000 square feet, and was designed specifically for the manufacture of Marietta precast insulated concrete wall panels which are used extensively in curtain wall construction of many industrial and commercial buildings.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## Ware Reviews $PO_3$ Production

The rapid growth of the phosphate industry in Florida and the opportunities for new products and expansion were emphasized by Louis Ware, International Minerals & Chemical Corp., before a joint meeting early in March of the civic and service clubs of Bartow, Fla.

"The real usefulness of this great industry is the phosphate which is shipped from here all over the country and all over the world to supply fertilizers and chemicals that are so necessary and add so much to the productivity wherever used," Mr. Ware said.

He observed that during recent years there has been a great change in the fertilizer business and that this trend will continue for a number of years. "I refer to the demand that has developed for high analysis goods richer in phosphorus, nitrogen and potash," he explained. "The farmers are learning to use this more expensive product which carries a greater percentage of nutrients for plant food, and have learned of its economy.

"As a result of this trend you have witnessed the construction of a number of large triple superphosphate plants. Approximately $60,000,000 worth of new factories have been built and these large plants process the raw phosphorous into more valuable material—they up-grade it."

"The manufacture of triple superphosphate on such a large scale is relatively new—it is a new industry. The processes are new and there is room for improvement. The usual equipment in many cases is not well adapted to handling the sticky, highly corrosive mixtures of phosphate rock, sulphuric acid and fluorine. I do not know of any plants which offer more opportunity for continued improvement of processes in the years ahead."

Mr. Ware outlined the opportunities of advances through research and reviewed the studies and production possibilities of uranium and fluorine. He also reported total employment and IMCC investments in new operations.

•

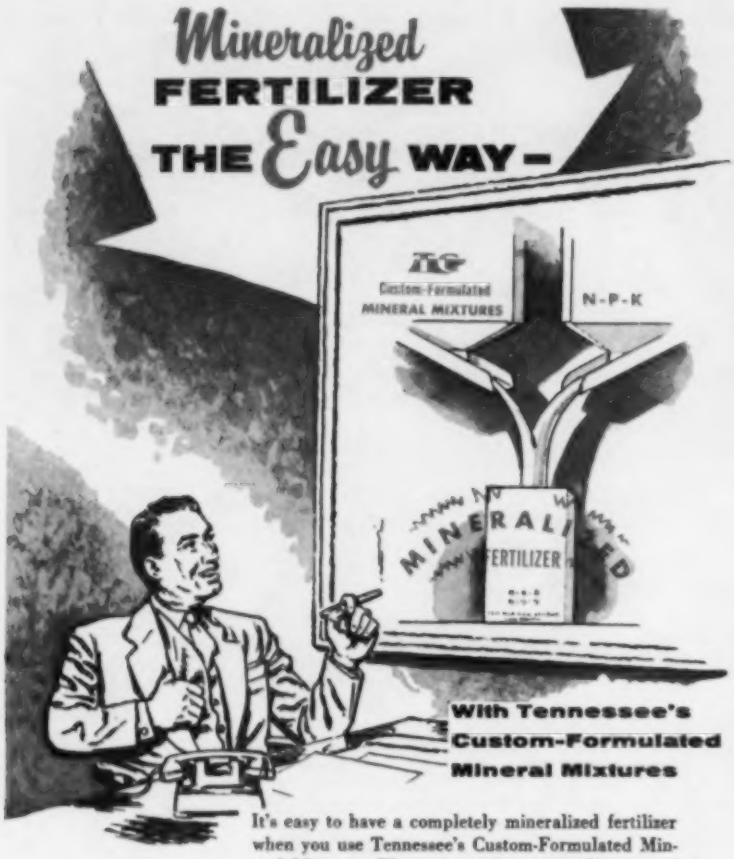
## New Bagpak Office in Denver

International Paper Co. has opened a new branch sales office in Denver, Colo., according to a recent announcement. The new office, which is located at Room 908, Equitable Building, 17th and Stout Streets, Denver, will house representatives of three of the company's leading divisions. Russell A. Gair, Jr., who was already located in Denver, will continue to represent the Bagpak Division, makers of multiwall shipping sacks.

•

## Freeport Has New Mine

Freeport Sulphur Co., New Orleans, recently began production of sulphur at a new mine in the swamplands of Louisiana near the town of Thibodaux. Freeport reports that the mine is part of a $25,000,000 expansion program involving an increase in production capacity of over three quarters of a million long tons per year.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*Samples, specifications and detailed information available upon request.*

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## Stauffer Expands Bayonne Plant

Stauffer Chemical Co., New York, recently completed an expansion of its Bayonne, N. J. plant for manufacturing, processing and formulating insecticides. The expansion program includes the installation of additional units to increase the air milling capacity of the plant as well as a modern unit for the formulation of liquid insecticides.

The Bayonne operation consists of laboratories and 6 manufacturing buildings over an area of 13 acres. Captan 50-W, the new organic fungicide, is formulated and processed at Bayonne for the Eastern area. The large sulphur and grinding plant also manufactures Magnetic "70" Sulphur Paste.

•

## Issue Tolerance Order

A final order establishing residue tolerances for 28 pesticidal chemicals was published in mid-March by the Department of Health, Education and Welfare in the *Federal Register* and will become effective at the end of ninety days.

On the basis of suggestions received from 11 major firms, the present order revises the tentative one issued last October. Major changes were as follows:

For ten pesticides, tolerances were established for additional crops.

The tolerance for chlordane was raised from 0.1 parts per million to 0.3 parts per million.

A tolerance of one part per million was established for dinitro-o-cyclohexylphenol.

A tolerance of two parts per million was established for nicotine, which previously had been given a zero tolerance.

The method for calculating tolerances for a mixture of residues with related pharmacological effects was restated and clarified.

•

## Gasal Named Delta Mgr.

Russell A. Gasal, former executive of Butler Mfg. Co., Kansas City, Mo., has been appointed general manager of the Beardstown, Ill., plant of Delta Tank Mfg. Co., succeeding John T. Nesser who has been named sales manager of the firm's liquified petroleum gas and equipment division. Delta manufactures tanks and cylinders for LP-Gas and anhydrous ammonia.

•

## Opens Kansas City Office

Pacific Coast Borax Co., N. Y., has opened a district sales office in Kansas City, Mo., to service its package, agricultural sales, and industrial sales divisions. Howard B. Cain will be package department sales manager for the Kansas City district, and F. M. Dosch, assisted by J. G. Neckerman, will be in charge of the agricultural sales division. Jack Loesel will take over industrial sales in the area.

L. LINVILLE

A. WILLIAMS

## Williams Succeeds Linville

L. A. Linville has taken up duties as assistant director of sales for Bemis Bro. Bag Co., St. Louis, and is succeeded as manager of the Bemis multiwall paper bag plant at Vancouver, Wash., by A. B. Williams, formerly sales manager there.

Mr. Linville will function as assistant director of sales in the absence from that post of C. W. Akin, who is temporarily assigned to plastic bag development.


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Top Photo: Mrs. Leta Rankin, secretary, Department of Agronomy; A. W. Young, Department of Agronomy; John Keys, Lubbock National Bank; Loyan H. Walker, West Texas Chamber of Commerce, Abilene, Texas; and Walter E. O'Neal, Mathieson Chemical Company, Plainview.

Bottom Photo: Dean W. L. Stangel, Texas Technological College; R. M. Fielder, West Texas Utilities Co.; Abilene, Tex.; Arthur M. Smith, Olin Mathieson Chemical Corp., Baltimore; N. D. Morgan, American Potash Institute, Shreveport, La.; W. E. Irwin, Phillips Petroleum Co., Bartlesville, Okla.

*Photos J. Compton, Lubbock Avalanche.*

## Role of Pesticides, Fertilizers, Herbicides in Cotton Production Spotlighted at 2nd Annual Agricultural Chemical Conference in Lubbock, Texas.

INSECTS cost cotton farmers $56-91 millions in a 20-county area of West Texas in 1954, in a section of the state which produced nearly half of Texas' cotton last fall and an amount equal to the production of any other state in the nation.

These figures were revealed during the second annual Agricultural Chemicals Conference held at Texas Technological College, Lubbock, early in February. Data for this tremendous loss due to insects is the result of an extensive survey of near-by counties by August Balzer, OK-Tex Chemical Co., Lubbock, and Dr. Donald Ashdown, professor of entomology at Texas Tech.

Insect ravages cost western cotton farmers an average of one-quarter bale per acre last fall, as a result of improper use or complete ignorance of modern insecticides. The survey pointed up the need for agricultural chemical manufacturers, distributors and dealers to promote their wares more vigorously.

The vast insect damage was one of the major topics at the conference, which also presented new aspects and problems regarding herbicides and fertilizers.

Dr. F. C. Bishopp, director of the Pink Bollworm Research Center, Brownsville, Tex., opened the session on insecticides with his address on "The Insect Menace and Development of Entomology."

Dr. H. L. Haller, assistant director of Crops Research Division, Agricultural Marketing Service, Washington, D. C., discussed the development and usage of chlorinated hydrocarbons, composed of carbon, hydrogen and chlorine, as insecticides (complete text appears on pages 44-45, this issue)

Dr. E. E. Ivy, United States Department of Agriculture, College Station, Tex., cautioned that systemic and organic phosphorus insecticides are still in the experimental stages in many cases, with attending high costs. He also stated that a great deal more research work is necessary to develop really effective phosphorus insecticides.

Dr. Russell Coleman, president of the National Fertilizer Association, Washington, D. C., emphasized the importance of fertilizers in the present and future national economies. Citing recent experiments which show that fertilizers can double crop and livestock yields, Dr. Coleman said, "For the future, it will be important not only to use more fertilizers, but to be sure that the elements are held in balance. In the case of orchard grass hay, nitrogen applied alone and phosphorus and potash applied together increased the yield slightly, but when the elements were all put together the increase amounted to more than 400 percent. Therefore , if the past offers any criteria for the future, there will be a most important place for fertilizers in our national economy."

With the tremendous use of irrigation, the West Texas area is becoming more and more an excellent market for commercial fertilizers. Between 25,000-30,000 wells are furnishing water for about 2,000,000 acres of land in the area right now. Nitrogen is most widely used as fertilizer, followed by phosphorus. More than one-half of the nitrogen comes from anhydrous ammonia, according to a recent survey.

Dr. W. E. Irwin, Phillips Petroleum Co., Bartlesville, Okla., explained that "nitrogen fertilizer has just one major function — to grow dollars. Our yardstick may vary, but the results must be positive for the producer, distributor and farmer. It must pay-off as extra yields, premium quality or better soil management with or without favorable climatic and economic conditions."

Discussing the functions and availability of phosphorus, Dr. Arthur M. Smith, Olin Mathieson Chemical Corp., Baltimore, Md., pointed out that phosphorus:

"1. Stimulates early root formation and growth;
2. Gives rapid and vigorous start to plants;
3. Hastens maturity of crops;

4. Is required for seed formation and phospho-protein in the germ plasm;
5. Increases the ratio of grain and fruit to stalk;
6. Increases winter-hardiness of fall-seeded grains and grasses."

Dr. N. D. Morgan, southwest agronomist for the American Potash Institute, told the conference of many instances where large crop yields were recorded following the addition of potash to the soil.

He concluded that potassium:

"1. Is a major plant-food nutrient,
2. Is necessary for production of carbohydrates,
3. Plays an essential role in the absorption of anions, such as nitrates,
4. Is essential for reduction of nitrates,
5. Favors protein manufacture,
6. Has a balancing effect on excessive amounts of nitrogen and phosphorus,
7. Gives plump, heavy kernels in grain,
8. Encourages root development,
9. Is necessary for tuber development,
10. Increases resistance to disease,
11. Improves plant vigor,
12. Is necessary for the development of chlorophyll,
13. Tends to prevent pre-maturity,
14. Increases drought resistance, and
15. Improves quality of some plants."

Dr. J. F. Fudge, Texas Agricultural Experiment Station, College Station, Tex., gave a talk on "Plant Nutrient Balance in Soils," and then joined in a panel discussion of fertilizers with the previous speakers.

"Controlling Weeds in Cotton" by H. E. Rea, associate professor in the agronomy department, Texas Agricultural Experiment Station, was the opening talk for the session on herbicides.

Mr. Rea said, "Our chances of having a low weeding cost are greatest when the weeds and grasses in our cotton fields are limited to annuals. The use of pre-emergence chemicals at planting and rotary hoeing and lateral oiling of young cotton are practices that are highly effective in controlling germinating weeds at shallow depths and grass seedlings.

Rea cautioned that "Neither the use of pre-emergence chemical treatment nor lateral oiling is suited for use in portions of the state (Texas) where cotton is planted in a furrow." He also described methods of spot-oiling to kill patches of Johnson grass.

Allen F. Wiese, Texas Agricultural Experiment Station, Amarillo, Tex., told the conference, "Control of annual broad-leaved weeds in wheat and sorghum can be achieved with 2,4-D in non-cotton producing areas. Annual grass must be controlled by cultural methods. The 2,4-D must be used with care or losses in yield may result." He further stated, "Control of perennial weeds should be started as soon as the weeds appear by using spot applications of soil sterilants . . . Large infestations of bindweed can be controlled by intensive cultivation with sweep type plows at three-week intervals under low soil moisture. Cultivations at two-week intervals are required under good moisture conditions . . . The most satisfactory method of bindweed control on large acreages of cropland is through competitive cropping, intensive cultivation, and use of 2,4-D.

E. H. McIlvain, Southern Great Plains Field Station, Woodward, Okla., talked on methods of improving grassland and native pasture. Of one controlled experiment, he reported, "Duplicate pastures were mowed for sand sagebrush control in June 1941 and 1942, deferred during the summers of those years, and grazed in comparison with untreated pastures for nine summers. The improved pastures carried 27 per cent more cattle, increased gain per head 32 pounds, produced 51 per cent more beef per acre, and increased profits 60 per cent, or by a margin of $2.04 per acre. Another pasture was improved by brush control and grazed year long in comparison with non-treated native range for six years. The brush-controlled pasture carried 70 per cent more cattle, produced 72 per cent more beef, and increased profits 70 per cent."

Earnest L. Thaxton, Jr., Texas Agricultural Experiment Station, Lubbock, reported the conditions under which he would recommend the use of chemical defoliants on cotton. He said, "If the farmer has more than 60 per cent of his cotton open and the rest near maturity, it is three weeks before frost and he is making somewhere in the neighborhood of one bale per acre or better, then probably he can well afford to apply a defoliant and expect a good return."

Top Photo: Panel members discussing insecticides: G. M. Watkins, Texas A&M College, College Station; E. E. Ivy, USDA Agricultural Research Service, College Station; F. C. Bishopp, Pink Bollworm Research Center, Brownsville, Tex.; H. L. Haller, Crops Research Division, Agricultural Marketing Service, Washington, D. C.; Donald Ashdown, Texas Tech.; and August Balzer, OK-Tex Chemical Co., Lubbock.

Bottom Photo: Some of the conference speakers: Allen F. Wiese, Texas Agricultural Experiment Station, Amarillo, Tex.; C. E. Fisher and Cecil Meadors, Jr., Agricultural Experiment Station, Spur, Tex.; H. E. Rea, Texas Agricultural Experiment Station, College Station, Tex.; Ernest Thaxton, Substation No. 8, Lubbock, Tex.; and Fred Elliott, Texas Extension Service, College Station, Tex.

*Photos—Texas Tech*

# Victor Chemicals improve fertilizers...

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Fred Elliott, agronomist for the Texas Experiment Station reported that the present use of defoliants and desiccants on cotton in Texas is extensive and usually profitable, when used under proper circumstances.

New chemicals and developments have made possible the efficient control of mesquite and shinnery oak growths that infest extensive areas of grassland, according to a report made to the conference by Cecil H. Meadors, Jr., and C. E. Fisher, Texas Agricultural Experiment Station at Spur, Tex. They disclosed that 2,4-D, 2,4,5-T and Silvex can control the unwanted growths easily and economically.

The conference was attended by more than 400 agricultural chemical dealers, distributors, processors, manufacturers, and users. Conference theme was the place of chemicals in West Texas agriculture.

It was sponsored jointly by Texas Technological College, A&M College System of Texas, Lubbock Chamber of Commerce and the West Texas Chamber of Commerce.★★

### Penn Salt Names Drake

J. Drake Watson was recently transferred to Pennsylvania Salt Manufacturing Co. of Washington's Tacoma headquarters offices as assistant to agricultural chemicals manager.

Mr. Drake was formerly district manager for Penn Salt's agricultural chemicals at Montgomery, Ala. before Korean recall to active duty as an infantry major.

Upon returning, he assumed duties as district sales manager, agricultural chemicals for North and South Carolina with offices in his hometown of Florence, South Carolina.

•

### Goodrich Appoints Wolff

J. S. Wolff was advanced recently to biochemical sales development manager of B. F. Goodrich Chemical Co.'s general chemical sales department, Cleveland, Ohio. Mr. Wolff announces that he and his department will be working to develop new markets for insecticides, fungicides and germicides for agricultural and industrial use.

Since 1953 he has been in the Cleveland home office as agricultural chemical staff representative. Previously he had served as development engineer and sales representative.

•

### French Firm Wants Distributor

An American agency for exclusive handling of insecticide products is being sought by the french firm *Etablissements Paul Escoulan & Ses Fils*, 5-7 rue Berthelot, Toulouse, Haute-Garonne, France.

### Dow Offers New Herbicide

"Baron," a nonselective new liquid herbicide is offered for industrial use by Dow Chemical Co., Midland, Mich. One gallon contains 4 lbs. of the active ingredient 2-(2,4,5-trichlorophenoxy) ethyl 2,2-dichloropropionate, which has the trade name erbon. "Baron" was tested last year under the code number M-171.

Applied to foliage the herbicide exhibits early contact action, followed by systemic action. It is said to be effective against perennial grasses.


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## Shade Tree Conference Held in St. Louis February 23-25

THE 10th annual meeting of the Midwestern Chapter of the National Shade Tree Conference was held Feb. 23-25, 1955, at the Chase Hotel, St. Louis, Mo. Drawing an attendance of nearly 300 from fifteen States, the three-day meeting was devoted to discussion of tree insects, diseases, and other problems pertaining to the care of trees and shrubs in the midwest.

At the business session, officers for the coming year were elected as follows: president, Frank Hanbury, Peoria, Ill.; vice-president, Charles W. Warren, Omaha, Neb.; secretary-treasurer, Noel B. Wysong, Cook County Forest Preserve District, River Forest, Ill. Elected to the Board of Governors for a two-year term were John W. Swingle, Denver, Colo.; J. C. Carter, Illinois Natural History Survey, Urbana, Ill.; Richard C. Sherman, Caterpillar Tractor Co., Peoria, Ill.; and C. L. Wachtel, Wauwatosa, Wisc.

A most timely paper, in view of the vast amount of new home building that is now in progress or contemplated throughout the U. S., was presented by Gerrit A. Visser, of the the Shield Shade Tree Specialists, Clayton, Mo., on the subject "Damage to Shade Trees from Construction Operations." Stating that valuable trees are worthy of protection and should be included in plans made for the development of home-site property, Mr. Visser said one of the most serious types of tree damage occurs when grades are changed, either by adding fill or making cuts.

In his discussion of "Trace Elements and Plant Health," E. R. Spencer, Lebanon, Ill., pointed out that increasing knowledge of the nutritive needs of plants indicates trace elements may be of much greater importance than formerly believed. He cited several examples of lush plant growth occurring on soils rich in these elements, and suggested the use of fly ash to improve depleted soils. Fly ash, he explained, is the residue that remains when coal is burned in blast furnaces, and said that it is available at many large industrial manufacturing plants. It contains, he stated, most of the trace elements needed for plant growth including copper, cobalt, manganese, boron, molybdenum, aluminum, sodium, fluorine, zinc and other minerals. The use of fly ash in pot cultures of several plants, he said, has produced good growth results.

A paper on "Concentration and Timing of Antibiotic Sprays for Control of Fire Blight," presented by Robert N. Goodman, University of Missouri, Columbia, received a great deal of favorable comment. Stating that investigations to date have indicated that antibiotic materials act both as systemic chemotherapeutants and protectants, Dr. Goodman said they have been found primarily active against plant bacterial pathogens. Fire blight, he explained, is a bacterial disease commonly found on apples, pears, and a variety of related plants.

The first successful experiments in the use of antibiotics to control fire blight, Dr. Goodman said, were performed in 1951 by Dr. A. E. Murneek of the University of Missouri. In these early tests, conducted in the laboratory and greenhouse, the antibiotics streptomycin, terramycin and thiolutin were used, principally on Jonathan apple trees. It was found that streptomycin and terramycin were effective control agents, and in 1953 the tests were extended to include apple orchards under conditions of natural fire blight infection. "Complete control was obtained," he said, "where 7 and 6 antibiotic sprays were applied at 4-day intervals beginning at either full pink or 30 to 50 per cent of full bloom with concentrations as low as 100 ppm." However, it was realized, Dr. Goodman said, that such an extensive spray program is too costly for commercial orchard use, so field experiments were conducted in 1954 to ascertain "the lowest antibiotic concentration and minimum number of spray applications necessary to provide adequate blight control."

In the 1954 tests, "Agrimycin," a commercially produced combination of streptomycin and terramycin, was used. Concentrations ranged from 25 ppm to 100 ppm, with 2 to 6 spray applications being made. In all spray schedules the first spray was applied when the trees were at approximately 20 to 50 per cent of full bloom, with successive sprays being applied at 4 to 5-day intervals.

It was found, Dr. Goodman said, that either a 4- or 3-spray schedule at 50 or 100 ppm concentration provided effective protection to the trees; a 4-spray schedule at 25 ppm concentration provided good protection. Fruit set, development and appearance were not impaired even by as many as six sprays at concentrations of 100 ppm. Slight marginal foliage burn occasionally occurred, he said, where antibiotics were applied at 100 and 50 ppm, but even this was not evident when the 25 ppm concentration was used. Further studies of antibiotic materials are planned for this year, Dr. Goodman said.★★

## Hold Aviation Short Course

100 agricultural aviators attended the fourth annual Indiana-Ohio agricultural Aviation Conference, Feb. 23-25, at Purdue University, Lafayette, Ind. Cooperating with Purdue University in sponsoring the event were Ohio and Indiana state agencies, the Ohio State University and Extension Service, Ohio and Indiana Custom Aerial Applicators, and USDA.

Sessions were held in agronomy, entomology and engineering. Discussions at the agronomy session included "Plant Defoliants," W. J. Redeker and R. G. Ueding; "Liquid Fertilizers and their Application," H. J. Mederski and Vernon Vick; and "Farmer Reactions on the Use of the Airplane," Irvin Schenk and J. Sawyer.

The agronomy meeting included such papers as "Some Important Insects Controlled by Airplane Application," H. O. Deay; and "Granular Insecticides," C. C. Compton. At the engineering meeting R. D. Barden spoke on "Factors Affecting Nozzle Spacing on Spray Equipment."

A complete account of the meeting will appear next month.

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### National Potash New Co.

A joint undertaking to produce potash from deposits near Carlsbad, N. M. was announced recently by Freeport Sulphur Co., New York and Pittsburgh Consolidation Coal Co., Pittsburgh.

A new Company, National Potash Co., has been formed to conduct the undertaking. Richard C. Wells, Freeport vice president and controller, will be president of National Potash. Thomas G. Ferguson, formerly a vice president of one of Pittsburgh Consol's divisions, will be operating vice president of the new company.

The project, including mine, plant and related facilities, will call for an estimated capital outlay of $19,000,000. National Potash has arranged to borrow $12,500,000 from an insurance company, and Freeport and Pittsburgh Consol will each supply half of the remaining capital requirements. The facilities will be designed to produce potash containing the equivalent of approximately 250,000 tons of potassium oxide per year.

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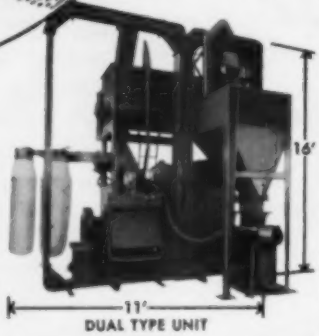
Compounding Plants now incorporate micro-pulverizers and Stoker valve bag packers on all stock models.

**THESE COMPLETE, COMPACT,** Ready-To-Run units assure: maximum per hour production; uniform quality products . . . at minimum labor and other operating costs.

**THE DUAL TYPE PLANT** elevates, mixes, pulverizes, blends and packages dust concentrates and field strength dusts, including those involving liquid impregnation. Jacketed mixers if specified.

Compounding and liquid formulating plants also engineered to your specifications.



*RTR Uni-Blender Liquid Formulating Plants liquify and blend toxicants used in production of liquid concentrates and liquid sprays.*

*Write for technical bulletins.*

**POULSEN COMPANY**

Engineers and manufacturers of materials processing and materials handling equipment.
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### Chem. Firm Appoints Managers

Two appointments to the staff of Chemical Enterprises, Inc., New York, distributors of anhydrous ammonia and agricultural chemicals, were announced recently. Virgil Rule was named regional manager of Pacific northwest operations and L. Wayne Cochran was named development manager.

Virgil Rule was formerly president and manager of Greenville Liquid Fertilizer Co., Greenville, Miss., and a president of the Agricultural Ammonia Institute.

Mr. L. W. Cochran was a research associate at Scudder, Stevens and Clark, where he specialized in the field of agricultural chemicals.

•

### Establish Farm Chem. Award

The first national award for outstanding achievement in the field of agricultural and food chemistry was established recently by the Kansas City section of the American Chemical Society. The prize, consisting of a gold medal and $500 in cash, will be known as the Charles F. Spencer award. It is being founded by Kenneth A. Spencer, president of the Spencer Chemical Co., Kansas City, Mo., in memory of his father, Charles F. Spencer.

The new award will be given annually to a U.S. Citizen who has made "meritorious contributions to the field of agricultural and food chemistry" in the U.S. First presentation will be made in Kansas City after Sept. 1, 1955.

•

### Standard Has Fert. Program

A $16 million program for fertilizer manufacture was announced recently by Standard Oil of California. Basic processing units will include an ammonia and nitric acid plant to be built at Richmond, Calif.

As part of the expansion program, California Spray Co. will construct a complex fertilizer plant for conversion of the chemicals produced at Richmond into fertilizers. The balance of the Richmond output will be marketed to industry through Orthonite Chemical Co., also a Standard Oil Co. subsidiary.

## NEWS Brevities

AMERICAN CYANAMID CO., New York, appointed L. C. Duncan general manager of the Lederle Laboratories Division and V. E. Atkins general manager of the Organic Chemicals Division. D. M. Benjamin, former executive director of Lederle, was named assistant general manager.

* * *

DR. CARL F. PRUTTON, vice president and technical director of the chemical divisions of Food Machinery and Chemical Corp., San Jose, Calif., has been elected to the company's board of directors.

* * *

DR. M. H. THORNTON has been named to the new post of technical director at Midwest Research Institute, Kansas City, Mo.

* * *

DAVISON CHEMICAL CO., division of W. R. Grace & Co., last month elected W. E. McGuirk, Jr., a member of the board.

* * *

RUSSELL E. SPIVEY has been named general manager of the Smith-Rowland Co., division of Smith-Douglas Co., Inc., Norfolk, Va. He succeeds W. W. Johnson, who resigned to take advantage of another business opportunity.

* * *

NOPCO CHEMICAL CO., has acquired new warehouse and office facilities in Portland, Ore., and will be represented in that city by John J. Ryan, its industrial sales representative for the Northwest.

* * *

THOMAS A. CHERRY, 68, retired supervisor for the Standard Lime and Stone Co., Martinsburg, W.Va., died last month when his car plunged into the Potomac River at Shepherdstown, W.Va.

FLO-MIX FERTILIZERS CORP. recently filed a charter of incorporation, with authorized capital stock of $300,000. The Corporation Trust Co., Wilmington, Del., will serve as principal office.

* * *

REPRESENTATIVES OF THE AGRICULTURE INDUSTRY will participate with members of other fields in research operations with the first industry-operated nuclear reactor, to be constructed within the next 18 months by American Machine & Foundry Co., New York, on a 250 acre site in the New York City area. Agricultural research will center on

# Pike's Peak

## ABSORBENT CLAY

### A BETTER CARRIER
### A BETTER DILUENT

NOT only will you save on ton prices, but Pike's Peak Clay will help speed up production. Its high degree of absorbency improves grinding and impregnating all toxicants. Pike's Peak's uniformly low moisture and pH of approximately 5 assure you complete compatibility with a *wide range* of toxicants.

You get extremely fine particle size which assures outstanding flow characteristic before and after impregnation. The standard grind is guaranteed 95% 325 mesh with a variety of other particle sizes available to meet your specifications.

A trial in your plant will convince you or write today for complete technical data.

**GENERAL REDUCTION COMPANY**

1820 ROSCOE STREET — CHICAGO 13, ILLINOIS

use of radiation for food preservation, disease resistance in plants, and increased crop yields.

* * *

SOIL BUILDERS INTERNATIONAL CORP. is operating its Clarksville, Tenn. plant at capacity and plans two additional plants to expand output of "Glorion," a combination soil-builder, soil conditioner and fertilizer.

* * *

THE FOURTH EDITION of "Chemical Who's Who" is now being compiled under direction of editors W. S. Downs and Williams Haynes. Qualifications for representation include at least ten years of service in education. science or with one firm in the chemical industry.

* * *

ARAMITE, a chemical developed for use against the poultry mite, was recently approved for sale by the Naugatuck Chemical Division, United States, Rubber Co., New York. Naugatuck has been testing the product for more than three years.

**Triangle Brand Copper Sulphate has been recognized as an effective agricultural chemical for more than sixty years. In sprays (where Bordeaux mixtures are the most reliable), in dusts (if you prefer them) and in fertilizers (for additional enrichment of the soil) Triangle Brand Copper Sulphate has proved itself worthy and dependable. Try these Triangle Brand forms of Copper Sulphate:—**

**INSTANT (powder) for quick and efficient mixing of Bordeaux sprays.**

**SUPERFINE (snow), SMALL or LARGE CRYSTALS, all containing 25.2% metallic copper.**

**BASIC Copper Sulphate in powder form, containing 53% metallic copper.**

***Write for booklets that will help you solve your agricultural problems.***

***Control POND SCUM and ALGAE with Triangle Brand Copper Sulphate. Write today for information on how it can help you maintain healthy water conditions.***

**PHELPS DODGE REFINING CORP.**
40 WALL ST., NEW YORK 5, N.Y. • 5310 WEST 66th ST., CHICAGO 38, ILL.


INTERNATIONAL MINERALS & CHEMICAL CORP., Chicago, has purchased all of the stock of U. S. Mining Co. and Peerless Perlite Co., both of Los Angeles, according to a recent announcement by Louis Ware, president. Assets acquired through the purchase include large reserves of perlite ore in Inyo County, Calif. a drying and grinding plant near Big Pine, Calif., and a perlite expanding plant in Los Angeles.

* * *

R. F. ALLEN has joined the staff of the Bemis Paper Control Laboratory, Boston, as laboratory supervisor and assistant to A. R. Ewing, laboratory head.

* * *

Appointment of Douglas A. Young as sales representative in the Chicago territory was announced last month by Arkell & Smiths, Canajoharie, N. Y. Mr. Young has been in the Arkell & Smiths sales training program at Canajoharie since July, 1954. His headquarters will be in the Chicago office.

* * *

SALES OF DIAMOND ALKALI CO., Cleveland, totaled $93,505,530, in 1954, setting an all time high for the company.

* * *

A $26 MILLION FERTILIZR PLANT is being erected at Kutahya, Turkey. Output will include 60,000 tons of ammonium sulphate fertilizers, 50,000 tons of ammonium nitrate fertilizers, 6,000 tons of concentrated acid and 1,000 tons of ammonia per year.

* * *

PRENTISS DRUG & CHEMICAL CO. has appointed Frank E. Dempsey & Co. as Canadian distributor for its complete line of insecticides, rodenticides and botanicals.

* * *

ROBERT S. THOMPSON has been elected by the board of directors of Thompson Hayward Chemical Co. to succeed his father, Charles T. Thompson, as president.

# PRODUCTS FOR THE *Dealer*

## Naugatuck Campaign for Dealers

The Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn. advertising and promotion program directed to help dealers increase their sales in the spring market gives special emphasis to Alanap 3, MH-40, Aramite and other new Naugatuck products.

The company has distributed to all Naugatuck dealers a "1955 Advertising-Sales Promotion Portfolio" which contains literature on Naugatuck chemicals, complete advertising schedules, and several technical bulletins including "Literature Summary on Maleic Hydrazide" and "Alanap Summary." The portfolio has samples of various advertisements for which Naugatuck will supply plates or mats.

## Pitts Coke Fly Bait

A new fly bait is being marketed by the Pittsburgh Coke & Chemical Co., Pittsburgh. The fly killer, "Dipterex-199," is said to kill both resistant and non-resistant flies in seconds and to provide up to 98% kills within a few hours after a single application.

The active ingredient in Dipterex-199 is Bayer compound L-13/59. Pittsburgh Dipterex-199 is packaged as a dry granular bait and sold in one pound shaker-type containers and 10 pound pails.

•

## Liquid Fertilizer Available

A clear, neutral, liquid fertilizer is being marketed by the Miller Chemical & Fertilizer Corp., Baltimore. The liquid fertilizer is available in three analyses; 8-8-8, 5-10-10 and 5-10-5. The manufacturer claims that half the nitrogen is in the longer lasting urea form and the phosphorus content is mobile for quicker plant use. It may be used to advantage in the late fall, because crystals do not form (salting out) until zero temperatures are reached.

## Closures for Plastic Bags

Kwik Lok Corp., Yakima, Wash., announced recently a pre-printed bag closure for identification of plastic bags' contents. The bag may be closed and labeled in one operation.

## Mathieson Offers New Fertilizer

"Plantrons," a new high-analysis granular fertilizer for home lawns and gardens, produced by Forward House, Inc., subsidiary of Olin Mathieson Chemical Corp., New York, is being test sold in five states in preparation for national marketing in the near future. The new product contains a special form of phosphorus designed to prevent absorption by other elements in the soil. Formula of "Plantrons" is 12 per cent nitrogen, 24 per cent phosphorus and 12 per cent potassium, together with the trace elements iron, copper and zinc. The product is in pelleted form and features a "mint odor."

In March, the program was started in San Diego, Calif.; Columbus, Ohio; Kansas City, Mo.; and Kansas City, Kan. During April, "Plantrons" will be offered in Cleveland and Springfield, Mass. The home garden fertilizer will be sold in packages of

4 oz., 1½, 5, 10 and 25 lbs. Forward House markets the 25 lb. package as a unit readily converted to a dispenser (illustrated above) for application of "Plantrons." The product is manufactured at the Olin Mathieson plant in Pasadena, Calif.

## Adds Methyl Parathion

Methyl parathion is now in commercial production by Monsanto Chemical Co.'s Organic Chemicals Division, St. Louis. The compound is an organic phosphate insecticide said to be effective in controlling aphids, mites and boll weevil, when formulated and applied as either liquid or dust. The properties of methyl parathion are similar to those of parathion, and methylparathion has about the same toxicity and requires equal care in handling as parathion.

•

## Bridgeport Aerosol Herbicide

A new aerosol herbicide with a "walking-stick" applicator that is said to concentrate the spray on a spot about 2 inches in diameter has been offered recently by Bridgeport Brass Co., Bridgeport, Conn., for the home garden market. Dispensing pressure in the aerosol product is provided by duPont "Freon."

The spot-weed killer applies 2,4-D and is suggested for use against dandelion, plaintain, ragweed, pig weed, dock, and other broadleaf weeds. One 12-ounce container according to the manufacturer, will treat 600 weeds. When the original container of aerosol weed killer is exhausted, refills may be purchased.

## Systemics Highlight Western Cotton Prod. Conference

THE use of systemic insecticides to control the thrips and aphids that have been slowing down cotton production in the Western states was one of the important topics discussed at the fourth annual Western Cotton Production Conference, Phoenix, Ariz., March 8-9. Other problems that came under consideration were verticillium wilt, boll rots, bacterial blight and root knot.

As a consequence of heavy damage inflicted on cotton by plant diseases during 1954, this year's conference stressed latest results of disease control research. Recently published statistics of the Cotton Disease Council indicate that California was hardest hit during 1954, with a loss of 164,000 bales of cotton, and Arizona second, with 101,000 bales lost.

A symposium on progress and problems in controlling cotton diseases was held Tuesday morning, March 8, comprising the following papers: "Seedling Diseases," B. R. Houston, USDA, University of California, Berkeley; "Verticillium Wilt and Bacterial Blight," Lester Blank, USDA, State College, N. M.; "Nematodes," M. W. Allen, University of California, Berkeley; and "Boll Rots," J. T. Presley, USDA, Beltsville, Md.

Later in the morning session Marvin Hoover, California Agricultural Extension Service, Shafter, spoke on cotton fertilization in California, and C. O. Stanberry, Yuma Mesa Soil and Crop Laboratory, Yuma, Ariz. discussed "Proper Water Use for Increased Cotton Yields."

"Needs for Expanded Research on Cotton Insects in the Far West," was the title of a talk presented by K. P. Ewing, Cotton Insects Section, USDA, Beltsville, Md., a subject which was pursued further in a symposium on new developments in cotton insects research. Individual reports were "Thrips Control in the Far West," W. A. Stevenson, USDA, Beltsville, Md.: "Systemic Insecticides in the Far West," H. T. Reynolds, California Agricultural Experiment Station, Shafter, Calif.; "Systemic Insecticides in the Southwest," J. C. Gaines, A & M College of Texas, College Station, Texas; and "Bollworm and Leaf Roller Control," G. L. Smith, California Agricultural Experiment Station, Shafter, Calif.

Other panels designed to assist in combating cotton pests were "Major Insect Problems and Their Control," J. N. Roney, Arizona Agricultural Extension Service, Phoenix, Ariz., moderator; and "Progress in Chemical Weed Control in Cotton," moderated by Chester Foy, U. S. Cotton Field Station, Shafter, Calif.

Attending the conference were farmers, representatives of the chemical industry, vocational agriculture workers, land-grant college and USDA representatives, agricultural aerial applicators, and members of related fields. The conference was sponsored jointly by the Arizona Cotton Growers Assoc., Southwest Five-State Cotton Growers Assoc. and the National Cotton Council, with Mitchell Landers, as chairman. Mr. Landers is president of the Southwest Five-State Cotton Growers Association.

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## North Central ESA Holds Conf. in E. Lansing

DISCUSSIONS of the systemics, new insecticide developments, entomological training, residue problems, etc., were featured at the tenth annual conference of the Entomological Society of America, North Central Branch, held March 24-25 at the Kellogg Center, Michigan State College, East Lansing, Mich. Dr. George C. Decker, Illinois History Survey, and president of the national society opened the 2-day session with an appraisal and forward look into the future of entomology.

H. H. Ross presented an address on "Systematics . . . Tool and Challenge," while C. C. Alexander, reviewed new insecticide developments. "A forward look into possible future achievements of the North Central Branch of the ESA" was discussed by chairman, T. C. Allen.

As in previous years, concurrent sessions of the various sections were held. The influence of insecticide residues on soils, phototoxicity of soil insecticides to field crops, and control of the European corn borer were among the topics considered by the section meeting on Cereal Crop Insects, while effects of defoliation by the forest tent caterpillar, chemical control of scab insects, and the gypsy moth outbreak were reviewed by the group on Forest and Ornamental Insects.

A. W. Lindquist presented a paper on "Livestock insect control with organic phosphates" at the session on "Insects of Man and Animals;" while W. M. Rogoff, at the same session, discussed systemic agents for cattle grub control.

In the session on fruit insects, M. L. Cleveland, S. C. Chandler and R. W. Rings, reported on insect damage to peaches. Other fruit problems were reported by C. R. Cutright, D. A. Dever, J. E. Fahey, D. W. Hamilton, and O. H. Hammer.

Stored Product Pest Problems were discussed by R. Latta, who acted as chairman of the section dealing with this problem. R. T. Cotton, reviewed the Khapra beetle situation; F. O. Marzke outlined the problem of mites and insects in dairy products; H. H. Walkden discussed stored grain fumigants; D. A. Wilbur reviewed grain protectants.

Control of the squash bug, potato insects, sweet corn pests, corn earworm, nematodes, etc., were reported on by J. M. Wright, G. E. Guyer, W. H. Luckmann, R. A. Blanchard and Ray Hutson in the section on Vegetable Crops Insects.

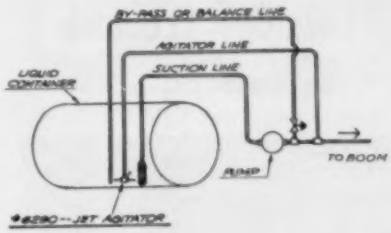
Section meetings on Toxicology, Parasites and Predators, Systematics and Biology, and Teaching filled out the annual meeting program.

F. Sherman III, was chairman of local arrangements, while C. R. Weaver was chairman of the program committee.★★

## Suppliers' BULLETINS

### New Jet Agitator Nozzle

Many chemicals used in farm spraying tend to settle apart in the drum, during the spraying operation, in spite of the movement of the tractor or rig as it moves across the field. This is particularly true where wettable powders are used. To maintain a proper mix, Spraying Systems Co., Bellwood, Ill., has designed the No. 6290 Jet Agitator Nozzle, which is positioned near the bottom of the drum. Liquid is sprayed in three directions, creating a random agitation pattern that continuously maintains an equalized distribution of chemicals. Design of the nozzle prevents the setting up of eddy currents and whirlpool action that could hinder the mixing process. The nozzle has been field tested with a variety of solutions and has proved effective. Illustrated schematically is a typical installation of the nozzle.




### Aminotriazole Herbicide

American Chemical Paint Co., Ambler, Pa., report that aminotriazol may have promise as an agricultural herbicide and defoliant. ACP will manufacture the agricultural compound as "Amizol."

•

### Alfalfa Weevil Control Folder

A new folder on how to control alfalfa weevils with "Heptachlor" was issued recently by Velsicol Corp., Chicago. Specific suggestions as to methods and rates of Heptachlor formulation are listed.

•

### New Hudson Multiwall

A multiwall bag, introducing a perforated upper corner for quick opening, was recently announced by Hudson Pulp and Paper Corp., New York. Perforations under the tape and near the sewing line permit the bag to be opened without the use of knives or other opening instruments. Hudson claims that this new device saves time and eliminates spillage.

### Doane Research Booklet

A booklet describing market and research service for business and industry is issued by Doane Agricultural Service, Inc., St. Louis. Twelve pages of data on market research covering fertilizer, crops, feeds, machinery, buildings, livestock, chemicals, and utilities give an overall view of Doane activities and service.

•

### Safety Catalogue Offered

A general catalogue on industrial safety equipment is available from Willson Products, Inc., Reading, Pa. It covers eye protection, head protection, respiratory protection and welding.

•

### Market Suspension Sprayer

A new agricultural tank sprayer, capable of mixing and applying all soluble and many non-soluble materials in suspension is being marketed by Nutritional Concentrates, Inc., New Lexington, Ohio. The equipment, called 'agi-sprayer', employs five agitators which keep its contents


# Berkshire

**SPECIALISTS in MAGNESIA for AGRICULTURE**

EMJEO (80/82% Magnesium Sulphate) Calcined Brucite (fertilizer grade) 70% MgO Calcined Magnesite 85 to 95% Mg O

**POTNIT**

(95% Nitrate of Potash) for Special Mixtures and Soluble Fertilizers Other Fertilizer Materials

**INSECTICIDES - FUNGICIDES**

Mercury Compounds for Agricultural Use

**DITHIOCARBAMATES**

Ferric — Zinc

**EXPORT-IMPORT**

**BERKSHIRE CHEMICALS, Inc.**

420 Lexington Ave., New York 17, N. Y.
55 New Montgomery St., San Fran. 5, Cal.
Cable Address — "Berkshem" New York

in a state of continual movement under hydraulic pressure.

•

### Liquid Nitrogen Applicator

A new PTO operated liquid nitrogen applicator for applying pressure or non-pressure solutions is being manufactured by Spra-White Chemical Co., Inc., Cedar Rapids, Iowa. Five blades carry the nitrogen into the soil at any depth up to 6", and a self-aligning leveler on each blade mounds the earth over the nitrogen to avoid its escape; also eliminates furrows which might be left by the blades. The Spra-White N-1 applicator gives up to 80 acres coverage per day, used before planting or while sidedressing. It can also be used for insecticides and herbicides.

•

### Ag. Engineering Book

"Agricultural Process Engineering" by S. M. Henderson and R. L. Perry was published last month by John Wiley & Sons, as the latest in the Ferguson Foundation Agricultural Engineering Series. The book expounds engineering theory and practice relevant to raising quality and yield and lowering production costs of farm product.

Both authors are professors at the University of California; Mr. Henderson at the Berkeley campus and Mr. Perry at the Los Angeles department.

•

### New Kraft Filling Machine

Kraft Bag Corp., New York, announced an automatic open-mouth filling machine, which will handle 22-24 100-lb. charges a minute, with one man hanging bags, and using standard size and standard type open mouth bags. The machine handles all weights from 25 to 200 lbs., with average variance of less than 8 oz.

•

### New Shell Soil Fumigant

"Nemagon," a new soil fumigant that gives excellent control of nematodes, and has great stability in the soil, has just been made available for limited commercial use. F. W. Hatch, manager of the Agricultural Chemicals Division of Shell Chemical Corp., N, Y., indicates that Nemagon has already been tested on a wide variety of crops including cotton, grapes, citrus, and other tree crops such as peaches and walnuts. Some crops appear tolerant enough of this chemical so that applications can be made around the roots of the living plant.

With established trees, applications of five to ten gallons per acre have controlled a wide variety of nematodes to a depth of 4 to 6 feet. The ability of "Nemagon" to reach such depths is due to its stability in soil, its high density, and the manner in which it is held to soil particles. Since it is stable in soil, it gradually disperses, killing nematodes as it moves.

Nemagon (1, 2-dibrome, 3-chloropropane) is currently being manufactured on pilot plant scale. Both liquid and dry formulations will be marketed in 1955. Nemagon will be available for limited sales this season on such crops as citrus, cotton, and grapes. Nation-wide marketing is expected in 1956.


*Hardinge* CONSTANT-WEIGHT FEEDERS
*for Fertilizer Blending*

Three Hardinge Constant-Weight Feeders for proportioning raw materials in a uniform blend onto a moving conveyor.

Many internationally known fertilizer manufacturers use the Hardinge Constant-Weight Feeder for their blending processes. Users of the Hardinge Constant-Weight Feeder for accurate fertilizer blending and mixing include:

International Minerals and Chemical Company
Farm Fertilizers, Incorporated
Stauffer Chemical Company
Sugar Beet Products Company
Baugh Chemical Company
American Agricultural Chemical Company
Smith-Douglass Company
Farm Belt Fertilizer Company
Virginia-Carolina Chemical Corporation
Comptoir des Phosphates Tunisiens (Tunisia)
The Fertilizer Plant, Incorporated (Iceland)

*Give us pertinent details of your fertilizer ingredients and characteristics when writing for additional information. Bulletin 33-E-37.*

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### S. A. Assn. Honors Caspari

The Sao Paulo Association of Insecticide and Fertilizer Manufactur-

ers awarded William Caspari, Jr., Davison Chemical Co. (second from left in photo) a certificate of honorary membership on his recent visit to Brazil. The presentation was made at a luncheon attended by directors and representatives of local firms.

•

### Young Exhibit in Chicago

The Young Machinery Co., Muncy, Pa., announce that plans have been completed to exhibit their stainless steel experimental transvair pneumatic conveying system at the 6th National Materials Handling Exposition to be held in Chicago, May 16-20, 1955.

Augmenting the Young transvair equipment will be a display of materials ranging in particle size from 5-10 microns to ¾" which today are being pneumatically conveyed with these systems.

•

### Triangle Announces Changes

Following the death of president J. R. Maddux, Triangle Chemical Co., Macon, Ga., recently named Harry E. Johnson, formerly executive vice-president, to the office of president. Richard H. Maddux was appointed vice-president and R. W. Jones, secretary-treasurer.

## FUNGICIDE RESULTS

(*From Page 59*)

These data (Table 1) show that under the conditions of this experiment, Karathane gave mildew control figures comparable with those obtained with sulfur. The degree of control obtained with Vancide P995W was not significantly different from that obtained with Karathane, but was less than with wettable sulfur. The apparent control obtained with Actidione at 1 p.p.m. and not at 2 p.p.m. is of doubtful significance. Extensive leaf injury obtained with this material made it difficult to estimate the area covered by the fungus. None of the other materials caused visible injury.

**Soil Treatment Control of Rhizoctonia**

W. D. Moore of the United States Agricultural Research Service and Robert A. Conover of the Florida Agricultural Experiment Station, write that root rot disease of vegetable plants, caused principally by strains of *Rhizoctonia solani*, has been of considerable importance on all soil types in Florida for many years. It causes poor stands, weakened plants, and reduced yields. Seed treatments have been beneficial in some cases and soil management in others, but no treatment has been devised thus far that will insure appreciable control under average field conditions. This is true particularly of snap beans.

Seed treatments of snap beans have generally increased stands somewhat under Florida conditions, but have not reduced the number of *Rhizoctonia* stem lesions to any extent. This lack of control might be attributed either to ineffectiveness of the materials used or to methods of application. Since the upward movement of the bean cotyledons through the soil at the time of germination removes a considerable amount of the chemicals from the root zone, the effectiveness of treatments applied to the seed is markedly limited.

Many chemicals have shown varying degrees of effectiveness against *Rhizoctonia*, but only within recent years have compounds become available that are highly specific for this fungus and at the same time not particularly phytotoxic. Various workers have found pentachloronitro-

benzene to be highly effective against *Rhizoctonia* on cotton and other hosts. In these cotton trials, the chemicals tested were applied over and around the seed at planting time or incorporated into the soil; thus a greater amount of material was used and better distribution than is provided by usual methods of seed treatment was obtained.

In the field tests reported here, with snap beans in the mid-winter growing area of Florida, chemicals were used in a similar manner.

Rows 25 to 100 feet long were used, with each treatment being replicated four times in a randomed design. Only chemicals that had controlled root rots on other crops or that had acted favorably against *Rhizoctonia* in laboratory tests were tested. Two types of application were used. (1)—Bean seeds were dropped in open furrows and the required amounts of chemicals were applied as dusts or suspended in water and sprinkled over the seed and surrounding soil. The treated soil was then carefully pushed over the seed with a hand rake. (2)—The second method is readily adaptable to commercial use. Chemicals were applied as a spray through a hollow-cone nozzle attached at the rear of the shoe of a bean planter. The nozzle was adjusted so that the seed, the open furrow, and soil covering the seed were all covered by the spray. The spray was applied at the rate of 30 gallons per acre.

The tests were made during the winter growing season in south Florida on marl, muck, and sandy soils, which differ materially in pH, temperature, moisture, physical characteristics, and cultural requirements.

Bean plants were pulled when approximately 6 inches tall and the

**Rhizoctonia infection of bean plants grown in marl soil following treatment with certain chemicals at the time of planting.**

**TABLE 2.**
*(Application by spray)*

| Material | Rate per acre | Total Plants examined | Percent infected with Rhizoctonia |
|---|---|---|---|
| PCNB 75% W.P.* | 5 lbs. | 413 | 13.4 |
| PCNB 75% W.P.* | 10 lbs. | 365 | 7.9 |
| PCNB 20% dust | 25 lbs. | 406 | 9.1 |
| PCNB 20% dust | 50 lbs. | 379 | 6.9 |
| Vancide 51 | 10 lbs. | 404 | 54.3 |
| Crag 5400 | 10 lbs. | 381 | 45.7 |
| Captan, 50% W.P. | 10 lbs. | 386 | 55.3 |
| Dowicide A | 2 lbs. | 388 | 65.0 |
| Dithane Z-78 | 10 lbs. | 382 | 54.6 |
| Check | — | 400 | 57.9 |
| LSD at 1% | | | 21.5 |

*Pentachloronitrobenzene wettable powder.

**TABLE 3.**
*(Chemicals applied by hand)*

| Material | Rate per acre (Active) | Total Plants examined | Percent infected with Rhizoctonia |
|---|---|---|---|
| PCNB* | 1 lb. | 764 | 12.3 |
| PCNB* | 5 lbs. | 660 | 2.9 |
| PCNB* | 10 lbs. | 757 | 3.2 |
| PCNB* | 20 lbs. | 864 | 2.4 |
| Captan | 5 lbs. | 667 | 41.3 |
| Thiram | 5 lbs. | 747 | 49.6 |
| Chloranil | 5 lbs. | 616 | 34.6 |
| Check | — | 857 | 49.9 |
| LSD at 1% | | | 20.8 |

*Pentachloronitrobenzene wettable powder.


A NATURAL QUALITY PRODUCT

TAKO

MICRON SIZE
Minus 1 Micron....55%
" 2 " ....68%
" 5 " ....85%
No Mica—No Alkalies
Airfloated; Bagged or Bulk
Guaranteed less 1% free moisture

QUALITY & SERVICE SINCE 1939

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below-ground steam areas were examined for *Rhizoctonia* lesions. In some experiments, only the percentages of plants infected were recorded. In other tests, plants were placed in four disease classes as follows: no lesions, light, moderate, and severe, the last class being characterized by girdling lesions, or two or more long deep lesions exposing vascular elements of the stem. Since there was little difference between treatments in the light and the moderate disease classifications, only the data on severe infections are presented.

Results of the first experiment comparing six chemicals are shown in Table 2. Tests were on marl soils with all treatments made by hand in open rows. It is apparent that the PCNB treatments were the only ones that reduced *Rhizoctonia* infection signficantly and, also that the heavier applications of this mtaerial were not significantly better than the lighter.

Subsequently, several dosages of PCNB were compared with other seed or seedbed treating materials on marl soil. These were applied as a spray during planting as described in the second method. Results from this experiment, shown in Table 3, again indicate the effectiveness of PCNB in reducing *Rhizoctonia* infection on beans. Although percentage infection decreased as dosage increased, there was no significant difference between the lowest and the highest rates of application of PCNB. Captan, thiram, and chloranil did not reduce *Rhizoctonia* infection.

Since PCNB was the most effective material used in the tests just described, additional dosage tests were made with the same amounts of PCNB on sand, muck, and marl soils. In addition, four dosages of a material (No. 363) similar to PCNB were included in the experiments on sand and muck soils. Water suspension applications on the sand and on the muck soils were made by hand as described for the first experiment, whereas the treatments on the marl soil were applied as in the second experiment. Results from the tests on all soil types are shown in Table 4. PCNB reduced *Rhizoctonia* significantly on all soils, but it is interesting that the degree of control varied considerably with soil type, the variation being greatest on the marl soil and least on the muck. Although the experimental material No. 363 was tested in only two soils, the results suggest that it may be equal to PCNB in reducing infection on snap beans.

**TABLE 4.**

**Rhizoctonia infection on snap beans on three soil types following chemical treatment of seed and surrounding soil at time of planting.**

| Treatment, lbs. active per acre | SAND | | MUCK | | MARL | |
|---|---|---|---|---|---|---|
| | Total plants examined | Means of Rhizoctonia percentages | Total plants examined | Means of Rhizoctonia percentages | Total plants examined | Means of Rhizoctonia percentages |
| PCNB* 1 lb. | 358 | 55.3 | 387 | 11.5 | 615 | 76.3 |
| PCNB* 3 lbs. | 319 | 31.1 | 356 | 18.7 | 557 | 37.2 |
| PCNB* 5 lbs. | 316 | 29.9 | 339 | 16.1 | 472 | 19.2 |
| PCNB* 10 lbs. | 352 | 13.0 | 369 | 4.2 | 601 | 13.4 |
| 363** 1 lb. | 332 | 42.8 | 373 | 22.1 | — | — |
| 363** 3 lbs. | 362 | 20.6 | 326 | 18.2 | — | — |
| 363** 5 lbs. | 322 | 13.4 | 363 | 12.6 | — | — |
| 363** 10 lbs. | 355 | 11.6 | 381 | 9.1 | — | — |
| Check | 303 | 66.7 | 337 | 23.5 | 429 | 86.3 |
| LSD at 1% | | 23.5 | | 11.0 | | 9.1 |

*Pentachloronitrobenzene 75% W. P.
**Experimental material similar to pentachloronitrobenzene.

The results of these experiments indicate that both PCNB and the experimental compound No. 363 reduced *Rhizoctonia* infection on snap beans under field conditions. Since


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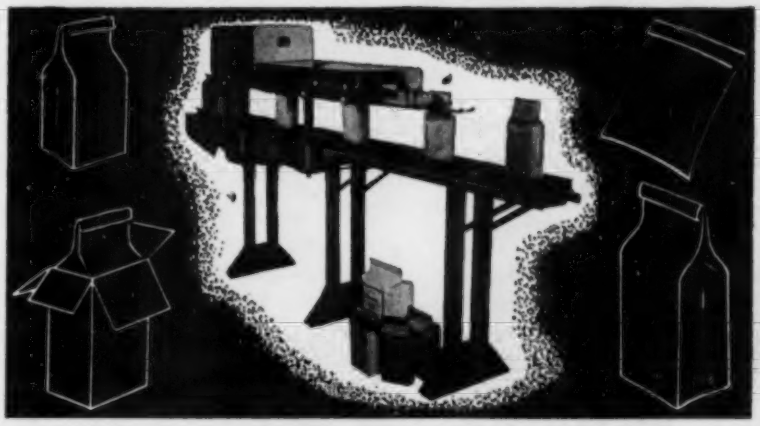

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these materials are not water-soluble and do not penetrate the soil readily, they require special methods of application for best results. Apparently, applications as sprays or dusts are effective if the materials are applied so that the seed and surrounding soil are well covered. Efficiency of the materials depends uopn the thoroughness of their incorporation into the soil. In these tests, considerable variation in degree of control occurred in different soil types when the same amounts of PCNB were used, the greatest response being found on marl soils and the least on muck. Nevertheless, in all cases, significant reduction in disease incidence was obtained with amounts that would not be prohibitive in cost to the average grower.

In evaluating these results, it should be noted that PCNB has little effect on other soil organisms which cause or are associated with damp-off and root rots under Florida conditions. In some instances, it has seemed that obvious control of *Rhizoctonia* has not lessened the over-all damage by root-rot. Also, the economic importance of *Rhizoctonia* infection on beans in Florida has not been determined; consequently the potential value of the effective treatments is not known. Although infections run about 90 per cent in many fields, and appreciable infection is found in all fields at all times, most growers produce average yields fairly consistently. The exceptions would be cases where *Rhizoctonia* reduced stands so much that the fields were abandoned or else replanted. Until such time as losses from this organism can be accurately determined, it appears that treatments for its control will have to be accepted for their potential rather than for their known value.★★

## NACA CONFERENCE

(*From Page* 34)

corn, the average value per acre is only $404-445; on the other hand, although total acreage for potatoes is only 1.7 million, the value per acre ranges between $250-300. Thus, the average grower of horticultural crops will be more inclined to spend $5, $10, or $20 per acre for herbicides if their use will help solve his problems. "But will the average corn grower with total gross value of less than $50 be willing to put out that kind of cash? The answer, of course," remarked Dr. Sweet, "is an emphatic no!"

Dr. Sweet pointed out too, that where weeding is essential in crop production (as in the horticultural crops such as onions, or in ornamentals), the cost of the herbicide is very small as compared with the labor cost in hand weeding.

Some of the technical aspects of current commercial compounds such as sodium trichloroacetate, 2,4-D, the propionics, chloro-IPC, CDAA, substituted urea products, etc., were discussed by representatives of industry.

Lloyd Sherwood, Monsanto Chemical Co., St. Louis, reported on two new classes of herbicidally active compounds: alpha-chloro-N, N-diallylacetamide (CDAA) and alpha-chloro-N, N-diethylacetamide (CDEA) which represent one class, and 2-chloroallyl diethyldithiocarbamate (CDEC), the other. All three compounds, he said, are effective and show selectivity particularly for pre-emergence elimination of annual grasses without damage to certain grass as well as broadleaf crops. "Preliminary indications are that no chemical residue will exist in the crop at harvest, therefore, it should be possible to obtain a marketing label during 1955," he remarked.

Dr. Sherwood summarized the uses of chloro-IPC to control weeds in cotton, alfalfa, clovers, bulb crops, etc.

The role of substituted urea products and ammonium sulfamate in the herbicide field was reviewed by A. E. Carlson, E. I. du Pont de Nemours and Co., Wilmington, Del. Dr. Carlson pointed out that a comparatively new field for chemical control of vegetation is along waterways . . . especially irrigation and drainage ditches, and river banks. In California, he noted, it has been estimated that about ten acre feet of irrigation water are lost each year per mile of un-

lined ditch, due primarily to weeds. This amounts to $75 a mile under usual conditions, but when water is scarce and crops could suffer, this loss can go as high as $1,000 per mile of ditch. "There is so much to be discovered in the field of regulating plant growth that I'm sure we will all find it challenging for many, many years to come," he concluded.

**Grain Storage . . . A Problem**

THE farmers' problems, and how they relate to storing or handling a clean grain product were considered by Donald A. Wilbur, Kansas State College, Manhattan, Kans. Dr. Wilbur remarked that "few farmers actually weigh grain before it is binned at the farm, so they do not know exactly how much the insects destroy; however in laboratory tests, a single granary weevil was found to reduce the total weight of a wheat kernel by approximately 55 per cent . . . a rice weevil reduces the weight of a kernel by about 25 per cent." He observed that three principal problems on grain sanitation facing farmers who store wheat are: (1) lack of proper storage facilities on the farm; (2) changes in the species and numbers of insects from year to year; (3) effects of climate.

"Many farmers," he said, "store wheat on the farm because they must do so, and they hope that next year they can get their wheat in the elevator." He pointed out that this discourages the construction of first class storage facilities. Surveyors report that the most important source of insects that attack stored wheat on Kansas farms is from improperly cleaned bins and granaries or from other grain and feed accumulations present about the farm.

Though wheat moves directly from farm storage into commercial storage, the insect problems are appreciably different in the two situations, Dr. Wilbur reported. Furthermore both situations may require diffeent approaches in the use of insecticidal control measures or in management practices. For example, protectants applied to wheat in farm storage are particularly useful if they have repellent as well as toxic properties. In fact, the repellent properties may prove more useful. The reason is because farm-stored wheat is normally free from grain-infesting insects at the time it is binned.

Toxic properties of protectants become more important and repellent properties less important when protectants are applied to wheat in commercial storage, remarked Dr. Wilbur. The most important insects in commercially stored wheat are rice and granary weevils and lesser grain borers. These species are generally of minor importance in farm stored wheat, because the wheat is not stored long enough on the farm for them to develop to damaging numbers. On the other hand, cadelles, which are the scourge of wheat stored in wooden granaries on the farm, are only occasionally pests in commercial grain storage.

Mr. Wilbur reported that "farmers are using insecticidal control in their grain storage program more than ever before. This includes residual spays to treat the premises, protectants to apply to the grain as it is binned, and fumigants to kill established infestations.

New methods being developed for the introduction of fumigants, while an air circulation system is in operation, may be useful to some of the country elevators but they are not likely to be useful on the farm, observed Dr. Wilbur.

**Workshop on Public Law 518**

WHAT you must do, and how must you do it to comply with the Miller Bill (P.L. 518)," was considered in a panel discussion which allowed NAC members to bring up specific problems for clarification or discussion. The panel, consisting of Winton B. Rankin, Asst. to the Commissioner, Food and Drug Administration; W. G. Reed, USDA, Pesticide Regulation Section, ARS, John D. Conner, NAC Counsel; and Joseph A. Noone, NAC technical advisor, first reviewed the requirements of the new law, and reminded Asso-


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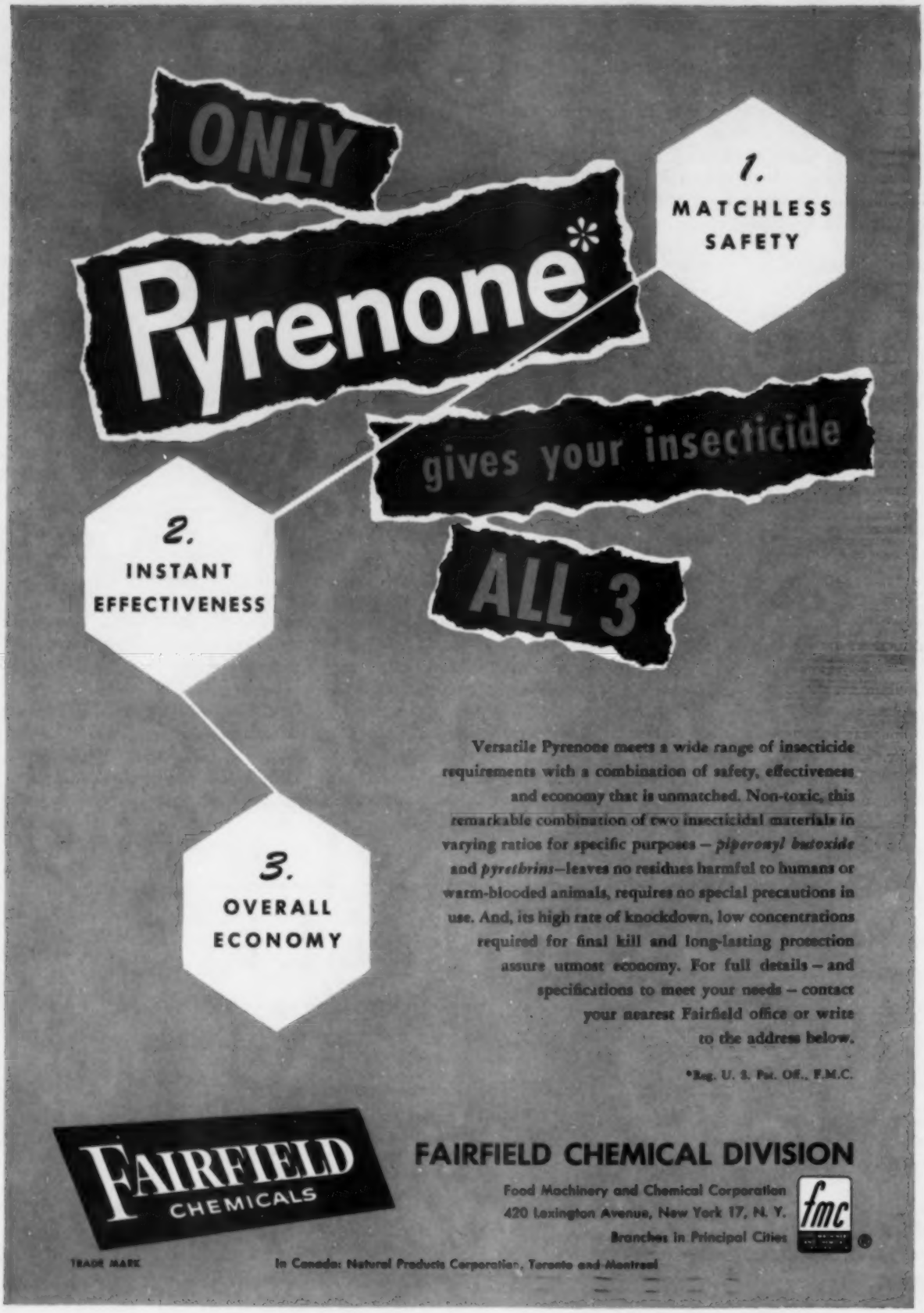
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ciation members of the June 22 deadline for filing. Questions as to possible extension of deadline, who must file, what might be the exceptions, etc., were answered by the panel in the final session of the meeting.

Mr. Hitchner, Association secretary announced that the entire question and answer period was being recorded and that copies of the transcript would be sent to all registrants.★★

## WASHINGTON REPORT

(*From Page 62*)

The Service has already begun reporting on blue-mold of tobacco which, as usual, showed up first near Tifton, Georgia. Outbreaks are reported further northward as the season progresses. Other important fungus diseases the Service can forecast with remarkable accuracy include the late blight of potatoes and tomatoes and the downy mildews of watermelons and canteloupes, squashes and cucumbers. This Service covers the forty-eight states.

**AC**

**Coming—talk of an enlarged garden sales promotion program is again being heard. Logically, the program would include those fertilizer, pesticide, and herbicide companies which have a major stake in the "small package" garden market. Several years ago, a general plan evolved which almost succeeded. There's some feeling now that the time is ripe for the proposal to be reviewed and a national garden sales promotion program developed which would ring the cash register.**

**There's some feeling that it's taking a little long for some groups to recognize the return of the buyers market and the size and potential of the garden market. Look for more on this in the months ahead.★★**

## FERTILIZER USE

(*From Page 55*)

between two and two and a half million tons annually. Applications necessary for maximum yields, however, would be much less after high rates of application had been made for a few years, as evidenced by the build-up of available phosphorus in east coast soils. Recent Wisconsin experiments indicate that following high initial applications of phosphate and potash, the subsequent rates required are less. It is expected, however, that rather high annual applications of nitrogen will be required to maintain top yields."

As in the South, tobacco is the most adequately fertilized crop. Soybeans, sorghum, grain, cotton, sugar beets, fruits and pastures would benefit only slightly from increased application of phosphate. But phosphate would increase considerably yields of corn, wheat, rye, barley, oats, flaxseed, potatoes, vegetables, and hay. Nearly all crops would benefit by larger quantities of nitrogen, with the exception of tobacco and soybeans. The differential between amount of nitrogen used in 1950 and the amount recommended for 1955 is greater here than in any of the four regions. As indicated by the accompanying table, nitrogen use must rise from 174,016 to 596,947 tons, that is more than 300 percent. The only area which shows a comparable nitrogen deficit is the South.

It is interesting to note in this connection that for the country as a whole, nitrogen is the plant food that requires the greatest proportional increase, followed by potash, although phosphate, the most heavily used fertilizer, requires the largest increase in gross tonnage.

From the marketing point of view, another significant fact brought out by the table is that fertilizer usage is most nearly adequate in the Northeastern and Western states, although in the former substantially more nitrogen is needed to achieve the potential yield. The report says, "The largest potential for increased fertilizer use in the northeast is on forage crops, particularly legume grass mixtures and permanent grass . . . Increasing the nitrogen rate to four pounds per acre on half this acreage, together with adequate lime, phosphorus, and potash would increase grass production fifty per cent, or the equivalent of an added four million acres of land. However, this would require 110,000 additional tons of nitrogen, which would double nitrogen consumption for the Northeast."

The USDA recommends a 25 per cent reduction in rate of phosphate use on potatoes in Maine, Rhode Island, and New York, and in potash on potatoes in Maine, Rhode Island, Connecticut, New York,


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Because of its varied topography and climate, the west shows even less uniformity of soil conditions than other areas of the country. Consequently, not many generalizations can be made for the area as a whole.

Phosphate and potash are used in relatively small quantities in western states because the soil is generally deeper, which slows down leaching, and is comparatively virgin. The only widespread deficiency is in nitrogen, which must be applied in greater quantities on corn, cotton, hay, small grains and sugar beets. Although deficiencies in the other plant foods are not frequent, when they occur they are apt to be as severe as in other areas of the country.★★

## POTOMAC PHYTOPATHS

(*From Page* 36)

variety, Wisconsin 537. Use of nonmutating varieties by breeders has proved an effective control method.

R. P. True, T. M. Judy, and Eldon Ross of West Virginia University told of their investigations to find a quick-acting chemical that will destroy the roots of oak stumps infected with wilt before the disease can be spread by root grafts. They are currently determining the rate of absorption of several chemicals, both by isolated oak stumps and by those that are joined to live companion sprouts.

Four USDA scientists found that 8 of 13 fungi tested responded in various ways to light. *Sclerotium rolfsii* was latent in the dark but developed sclerotia rapidly under light. Strains of *Stemphylium* sp., *Pestalotia* sp., and *Verticillium albo-atrum* sporulated freely under fluorescent, mazda, or blue light, but not under red light nor in the dark. Still others developed under red light and in the dark. Researchers were: W. D. McClellan, H. A. Borthwick, Ida Bjornsson, and B. H. Marshall.

Dr. Marshall also described the development of dry rot disease of gladiolus under the influence of various chemicals. High nitrogen levels caused an increase in size of sclerotia of the fungus, while high levels of potassium, and to a lesser degree, of magnesium and phosphorus, caused an increase in the number of sclerotia.

M. E. Gallegly of West Virginia University reported on a technique developed there for testing new potato and tomato varieties for resistance to late blight. The technique is based on the fact that the late blight fungus exists in numerous physiological races that can be distinguished from each other by the different reactions of host varieties.

McClellan, Smith and Edgar A. Taylor of USDA reported on their efforts to develop a successful rose dust mixture. All mixtures tested contained DDT and lindane, some fungicide for black spot control, and some miticide. Four fungicides provided excellent protection — as measured by flower size and yield of a susceptible rose variety. These were: copper oxysulfate 3.4 per cent copper with 25 per cent sulfur substituted in September and October; ferbam 7.6 per cent and sulfur 25 per cent; captan 5 per cent; and zineb 6.5 per cent. Of the miticides tested, Aramite proved superior, providing good mite control and compatibility with the fungicides.

R. R. Romanko and J. W. Heuberger of the Delaware Agricultural Experiment Station found captan, zineb, and combinations of the two effective in controlling fruit rot (*Botryosphaeria ribis*) of Rome apples. Captan reduced the incidence of disease in harvested fruit from 37 to 6 per cent; in fruit in cold storage for 87 days, from 45 to 3 per cent.

Two other Delaware scientists, L. R. Krupka and D. F. Crossan, report that bacterial leaf spot of peppers could not be eradicated with sprays of the antibiotic, Agrimycin. Three applications of this drug at the rate of 250 parts per million gave moderate protection of pepper plants from bacterial spot, but 500 ppm failed to eradicate the organism from infested pepper leaves.

University of Maryland scientists M. H. K. Rushdi and W. F. Jeffers reported that several fungicides would cause complete or partial inhibition


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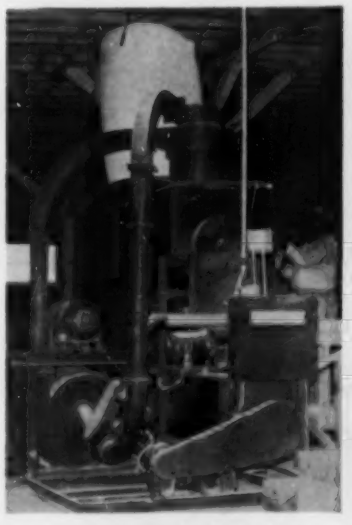

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of the soil-borne fungus, *Rhizoctonia solani*. Among those that gave 100 per cent control were Puratized, Arasan, Semesan, Vancide 51, and Zerlate. Increase in soil temperature and moisture did not cut the efficiency of these fungicides, but addition of 1 per cent hay or wheat straw reduced activity of Puratized, and addition of 5 per cent hay reduced activity of all but Vancide 51. Increasing soil pH from 4.5 to 6.1 increased activity of Puratized and Vancide 51.

Another Maryland plant pathologist, O. D. Morgan, found in his studies that the tobacco anthracnose disease produces different symptoms on a wide variety of plants. With tobacco, peppers, tomatoes, cucumbers, soybeans, peas, sugar beets, and several other plants the disease occurs as a leaf spot and causes lesions of stems, petioles, and veins. It occurs as a dry rot on red top, brome, sudan, and rye grasses, and as a wilt with smaller plants such as leaf and head lettuce, alfalfa, and red and Ladino clover.

Maine plant pathologist R. V. Akeley said that most potato varieties that have been bred to resist common late blight stand up well under heavy blight infection. However, fungicides recommended for the control of late blight were not effective in protecting field plantings of non-resistant potatoes from this disease.

Robert E. Adams of West Virginia reported that increased growth of young peach trees in BHC-treated soil was apparently due to control of a root-feeding nematode. Treating the soil of apple orchards with BHC reduced the number of nematodes and improved the appearance of the trees without causing off-flavor in the fruit.

USDA scientist A. Morgan Golden said that his study of the spiral nematode on boxwood showed that the pest did damage in three ways: it mechanically punctured roots; changed the chemical contents of root cells by apparently secreting toxic substances; and removed the cell contents as food. Over all, this damage causes boxwoods to brown and become stunted.

In his studies of the root-knot nematode, Dr. G. Steiner of USDA found among other things that the female nematode inside the root is so located that hatching larvae are released close to the root surface and soil, thus putting them in a good position to move to other roots.★★

## PROFITS NEEDED

(*From Page* 38)

Springfield, Boston, Nitro and Texas City are regularly referred to our Creve Coeur laboratories where the 2000 likeliest ones are screened each year for pesticidal activity.

There is other work going forward in other locations to determine the practicability of formulating these compounds and to develop the most economical process to produce them.

Besides our own efforts, there is the field work of our academic collaborators. We have doubled the number of our grants-in-aid since 1951 and built a top-notch team to follow this work and to keep us posted on all developments in the field. We are also working with commercial growers to make sure the use of these new products is economically sound and otherwise practical.

This intensified four-year program is just now bearing fruit. A few months ago, we announced three new herbicides specific to grass-type weeds. Our other work in plant growth regulators, defoliants, fungicides, nematocides, insecticides and miticides is progressing well.

I have used the word "profit" a number of times in this talk, and I make no apology for it. The steady flow of profits among us is the common bloodstream of our business. Anemic profits in any segment of our industry can cripple the growth of all segments.

Probably the first commandment, then, to guide us out of chaos should be "Thou shalt make a profit".

The second commandment is like unto it: "Thou shalt study thy costs so thou wilt know a profit when thou seest it". Consignments cost money and "deals" dip into the till. Good cost accounting may be more effective

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than a good conscience in keeping us on the narrow paths of sound business practice.

Third, "Thou shalt not covet thy neighbor's profit". Sure, go after your competitor hammer and tongs. But let your suppliers and your distributors and your customers make their profit too. Without profit the industry stagnates—and the worst damage will be to the farmer.

Historians tell us that in every major conflict there comes a period when the tides of war reach their ebb. The pattern of victory slowly emerges. Curiously enough, this "year of decision" is usually the third year of the war. Let's make 1955 our "year of decision". '53 and '54 were certainly discouraging. We may not be able to win the war in '55, but we can set ourselves on a course which will restore the prestige and profits our industry deserves.★★

## BORON IN FERTILIZERS

(*From Page* 41)

state officials list the recommended amounts of borax in their bulletins of fertilizer recommendations for each crop.

Some states, such as Virginia, have provided in their new laws the regulation as to amounts of borax that may be added and guaranteed. This has brought about uniformity in the amounts of borax sold in fertilizers and permitted the manufacturers to plan their mixing operations to avoid the added cost of custom mixing.

One of the recent trends in boron use is the lead taken by the South Carolina Agricultural Experiment Station in the use of slowly soluble borates, wherein a small continuous supply of boron may be available to crops such as cotton produced on sandy soils and in regions of high rainfall. Here Colemanite, a calcium borate material, has advantages over the more soluble sodium borates.

In the Pacific Northwest, outstanding results have been obtained with Polybor-2, a highly soluble, highly concentrated borate that may be applied with regular spray or dust application (see photo).

Liquid fertilizers and fertilizer applied through irrigation facilities are new developments that lend themselves to the use of soluble borates. This practice is already in use in some areas.

Granulated fertilizers may be borated during the process of granulation or blended with borates of proper mesh size after granulation.

Although complete fertilizers are generally the best means of supplying the necessary boron to crops, there are some places and crops where the borated fertilizer must be supplemented with foliage applications to obtain highest yields and quality of crops. Broccoli (see photo) is one of the crops where both soil and foliage applications give best results.

Efficient crop production is the "battle cry" of agricultural leaders to help the farmer in the price-cost squeeze. Proper use of complete fertilizers, often including boron, offers one of the main hopes of aiding the farmer in attaining higher efficiency.★★

## PHILIPPINE STUDY

(*From Page* 43)

as the Japanese and Swiss are manufacturing.

Over 40 field fertilizer tests have given some remarkable results. Yields of corn have been tripled in many cases by topdressing applications of nitrogen only. With a good variety, corn yields of 100 bushels per acre were obtained on the college farm from the additions of ammonium sulfate alone (see Figure 2). Roasting ear corn profits were more than tripled in one of the outlying field tests. That is very important to the tenants and small landowners in higher areas where lowland rice culture is impractical.

Nitrogen has also proved to be of considerable value in the growing of coffee. Early vegetative growth of young seedlings was increased remarkably by nitrogen additions, thus shortening the pre-bearing period. Preliminary greenhouse trials have been made on the use of urea as a spray material. Noticeable greening


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of the plants resulted if the concentration were kept under 0.25%. Research on this is being continued and expanded.

Some 25 outlying tests on both corn and rice show that elements other than nitrogen are also important in certain soil areas. For example, in one experiment run by Dr. N. L. Galvez of the soils department on the Bilibid prison farm a few miles south of Manila, applying as much as 135 Kg nitrogen per hectare gave complete failure for corn unless phosphate was applied also (see Figure 3). The height of the plants receiving no phosphorus never exceeded about two feet and the plants showed the characteristic purpling of phosphorus deficiency. Although time has not permitted the field-testing of all the major soil areas, even of the Island of Luzon, chemical analyses indicate quite strongly that other phosphorus and potash-deficient areas are present in the Islands. If adequate support can be obtained, it is expected that these soil areas can be more accurately located.

The response of lowland rice to fertilizers has not been found to be quite as marked or consistent as that of corn. Most varieties of rice now in use tend to lodge even without the addition of fertilizers. Even so, however, in most cases profitable responses have been obtained. Fertilizer tests are being made with new and improved varieties which are stiffer strawed, and more marked increases are expected. Upland rice is considerably more responsive than lowland, the former behaving more nearly like corn.

The need for limestone is quite apparent in some areas. For example, one study showed marked acidity resulting from the use of ammoniacal fertilizers on citrus and coffee soils. Because of the frequent and rather heavy applications of ammonium sulfate for these crops, which are grown on relatively light soils, this problem is rather serious, particularly in the case of magnesium, which is not found in the local limestones. A soil acidity survey has been planned and should give some general information on the extent of this problem.

In a short period of time the U. P. College of Agriculture staff have "cracked" the door of opportunity for the use of agricultural chemicals. In recent months, two Cornell professors concerned with the use of chemicals have been added to their staff. These men, Dr. S. N. Fertig and Dr. George Matthysse are to give technical assistance in weed and insect control respectively. They have competent Filipino counterparts who should do much in the next couple of years to further evaluate the possibilities of agricultural chemicals in that area.

Problems? Yes, there are plenty of them. Research takes money and even the remarkable initial support given by both the U.S. and Philippine governments has not kept pace with the needs of the program. As was planned, the U.S. support for the maintenance of the Institution has tapered off. Although the Philippine government has greatly increased the peso support, a four fold increase in student enrollment has prevented the adequate expansion of agricultural research. Some commercial support has been obtained and at least one private foundation has shown significant interest in the project. To some extent the measure of success of the agricultural research at the College during the next few years will be determined by the support which can be obtained from these sources. The opportunity is there. Let us hope it is not missed.

## ILLINOIS SURVEY

(*From page* 40)

controlling house flies, a time-saving method that with one application gave 90 to 95 per cent control of house flies in several large dairy barns in which it was first tried. Later he increased the effectiveness of baits by the addition of attractants. Through laboratory studies, he predicted the resistance of house flies to lindane, methoxychlor, chlordane, dieldrin, and other chlorinated hydrocarbons one to two years before such resistance occurred in the field.

A study of the effect of insecticides applied to soil was begun by


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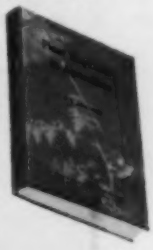

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Natural History Survey entomologists in 1953. Included in the initial study were such soil-inhabiting pests of corn as seed corn maggot, seed corn beetle, wireworms, grape colaspis, and white grub. Records were obtained from 60 cornfields, in each of which the greater part was treated with aldrin and a part left untreated. Observable benefits that resulted from treatments included a greater number of healthy plants, improved plant growth, earlier and more uniform tasseling, less plant lodging, and increased yields of corn. Similar treatments in 1954 confirmed the favorable results of the previous year.

Soil treatment with aldrin in 1953 and with aldrin, heptachlor, or lindane in 1954 was used by a plant pathologist of the Natural Survey as an indirect means of reducing the amount of bacterial scab of gladiolus in fields of commercial bulb growers. Any one of these materials applied in the furrows before the corms were planted effectively controlled white grubs, which apparently help to spread bacterial scab.

In 1954, tests were made by a staff entomologist to determine the effect of soil treatments in the production of truck crops. Benefits of soil treatment just before the seeds were planted were evident in onion, cabbage, and radish plots treated with aldrin, heptachlor, or dieldrin, in turnip plots treated with heptachlor, in potato plots treated with aldrin or heptachlor, in Hubbard squash plots treated with aldrin, and acorn squash treated with dieldrin.

Plant pathologists on the staff have for many years maintained an experimental plot in which they have tested the effectiveness and safety of new fungicides applied to trees of various species. Greatest challenge to the plant pathologists in recent years has been presented by diseases of shade and forest trees. Measures developed elsewhere, principally by federal scientists, for controlling phloem necrosis of elm had been effectively adapted to Illinois conditions when, in 1950, the Dutch elm disease made its appearance in the state. Both diseases are spread by insects, and principal dependence for control has been placed in spraying with chemicals to kill the insect vectors and in burning of dead elm wood to destroy the breeding places of the vector of Dutch elm disease.

In experiments in the Natural History Survey greenhouse and in the experimental tree plot, chemotherapy has given some promise of being effective against the wilt disease in small oaks.

In studies of artificial lakes, rotenone is commonly used by fish technicians of the staff to poison undesirable fish populations. Other chemicals have been used experimentally in efforts to control unwanted vegetation in artificial lakes.

In issuing recommendations for control measures against any insect enemy or plant disease, entomologists and plant pathologists of the Natural History survey include, whenever possible, simple rule-of-thumb criteria by which the user can determine the degree of infestation that will justify chemical treatment. They try to gain and keep the confidence of the prospective user of insecticides by recommending only such control measures as seem beyond doubt to be necessary. They believe that to recommend control measures that are not needed or that cannot be justified on a dollars-and-cents basis will quickly destroy that confidence.★★

## COTTON INSECTICIDES

(*From Page 45*)

often used in combinations of two or more in a single formulation. For example, DDT is effective against the bollworm but not the boll weevil. Benzene hexachloride will control the boll weevil but not the bollworm. Neither of these two insecticides is toxic to spider mites, but sulfur is. The three chemicals have therefore been combined into one product, popularly designated as 3-5-40. It is used extensively as a cotton dust in many areas. Five percent of DDT and 40 percent of sulfur is also frequently combined in dust form with aldrin, dieldrin, heptachlor and toxaphene at the recommended dosages of these insecticides for use on cotton.★★


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# Tale Ends

NEVER saw meeting sessions better attended than at NAC's spring gathering in St. Louis. With a practical program built around the theme, "Better Farming with Agricultural Chemicals," all elements of the industry were counseled to get out and sell the new markets in '55,—and reminded forcefully by one key speaker that the first commandment to successful business is, "Make a profit!"

AC

**Charlie Zorsch of Monsanto served as a hard working chairman of the program committee. Taking his duties very seriously, he instituted an innovation in chairmaning which could profitably be duplicated at other such gatherings. "Red" stationed himself right alongside the hotel room clerk's desk while registrants were checking in, and was in an on-the-spot position to referee any disagreements as to room reservations. A service that was much appreciated.**

AC

How come a luncheon-banquet, instead of the usual evening affair? We got curious and inquired. The answer we got was that it had originally been hoped to have Secretary Benson address the gathering, and it seemed logical to anticipate that the secretary's remarks might find a more attentive audience if he was not required to compete with the strains of "Don't give me no goose for Christmas, Grandma," the usual familiar theme song of past NAC banquets.

AC

*A new entomological delicacy,—toasted grasshoppers—was introduced in the Velsicol suite. No kidding, folks, they really package these in Japan in all seriousness, and gourmets, they tell us, consider them just grand. We have a feeling, though, that their appeal here will be somewhat limited, even among entomologists.*

AC

**"The Hexing of Ben McWeevil" is the sad theme of a new mailing piece just gotten out by Frontier Chemical Co. of Wichita. A parody on "The Shooting of Dan McGrew" it recounts how a bunch of bugs were whooping it up, only to run into a benzene hex, and finishing up on the theme:**

**Between you and me, this BHC**
**Is a mightly potent mix.**
**As produced by the Frontier Company,**
**It packs a lot of kicks—**
**High in gamma isomer for insecticidal punch**
**I know I wouldn't care for any BHC for lunch.**

AC

We have a claimant to the title of having thought up the idea of putting fuel oil trucks to work during the off-season delivering and applying liquid fertilizer to home owners' lawns. Archie Smith, head of Smith Equipment & Supply Co., Chicago, makers of "Fertil-Aide" liquid fertilizer, says he got the idea in the summer of '53 and has been adding steadily since then to the list of home owners he services. This season he is offering a complete lawn service, including spraying lawns to kill weeds and crabgrass, plant and soil insects. He sees the lawn spraying service idea as a "Don't Do It Yourself" operation, designed to give home owners lawns equal to those at country clubs.

AC

**The bugs seem to have ganged up on New Jersey: not only have the mosquitoes built up a resistance to DDT, but the white fringed beetle has recently made its debut in the state.**


## Strike Two!

WHEN they've got you two strikes down, it's sort of hard to take your best cut. And when you're a salesman out calling on the trade, and they don't remember your company, and never heard of its product, they really have two strikes on you.

The moral of this story is that when you send your salesmen out to call on what should be live prospects, if you want them to take that big full swing and maybe knock out a sales home-run or two, see that they don't already have two strikes on them when they step up to the plate.

Pave their way in advance, with an advertising program that will make your company name and your products familiar to the prospective buyer. In the field of agricultural insecticides, fertilizers, herbicides, etc., the magazine that can do the best job of presenting your sales story to the important people in the commercial end of the business who make most of the important purchasing decisions, is

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Farmers all over the world, growing a diverse number of food, feed, and fiber crops, rely on toxaphene for effective, long-lasting insect pest control. Toxaphene insecticides are now officially recommended for use against more than 200 species of destructive insects around the globe. On many crops, toxaphene is the standard insecticide for all-season control.

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